# My WISE-PaaS

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# Smart Energy Management: Key to a Sustainable Future

*Advantech Implements Smart Wireless Routers for Substation Communication*
P.14

ADVANTECH
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AIoT Solutions & Marketplace







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Connecting Industrial Data via

## WISE-EdgeLink

Safe, Simple, and Efficient

**Secure Integration**
Secure Data Conversion for Integrating Data with Third-Party Systems

**Zero Coding**
Rapid cloud-based deployment without programming

**Security**
- VPN
- OPC UA
- Whitelisting

**Data Collection**
- Data Acquisition
- Protocol Conversion
- Data Pre-processing

**Data Management**
- Data Logger
- Notification/ Alarm
- Store and Forward

**Publish Service**
- Data to Cloud
- MES / ERP
- Open API

### Transmitting data to the cloud for easy integration

Advantech's WISE-EdgeLink is a lightweight gateway software solution that supports data acquisition for asset monitoring, performance tracking, alarm notifications, system management, and remote configuration. WISE-EdgeLink ensures easy migration from stand-alone legacy systems to modern IoT architectures by providing an intelligent platform that serves as a bridge between devices. Furthermore, WISE-EdgeLink enables superior monitoring and control of field equipment and industrial facilities.

ADVANTECH
*Enabling an Intelligent Planet*

Edge-SRP
Edge Solution Ready Package

**Edge Data Collector Solutions**

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ESRP-PCS-ECU1051
ESRP-PCS-ECU1251
ESRP-PCS-UNO420
ESRP-PCS-WISE710

ESRP-PCS-ADAM3600
ESRP-PCS-ADAM6717
ESRP-PCS-ADAM6750
ESRP-PCS-ADAM6560D

**Edge Analyzer Solutions**

ESRP-CSS-UNO2271
ESRP-CSS-UNO1372
ESRP-CSS-UNO2484
ESRP-CSS-UNO2372

ESRP-AWS-UNO2271
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# Enabling a More Sustainable Planet with Smart Energy Monitoring and Management Solutions

Smart monitoring and management is a vital consideration when creating sustainable solutions that conserve energy and protect the planet. This issue of MyWISE-PaaS Energy edition features in-depth discussions about real-time smart monitoring and management solutions.In the Advantech View column, Mr. Hai Ngo from Advantech Vietnam talks about developments in ASEAN countries, which are some of the most preferred investment locations. Mr. Hai also elaborates on how Advantech Vietnam has cooperated with ecosystem partners to provide smart technologies to Vietnam Electricity (EVN) and other customers in the digital substation, smart energy management, and renewable energy application market.

Global energy consumption is transitioning from traditional to renewable energy resources. Thus, the Power Insights section focuses on the current and future status of electrical grids, and the challenges that they face. Experts including Prithpal Khajuria, Global Segment Leader of the Power Sector in the IoT Group at Intel®, and Jason Shephard, Vice President of Ecosystems at Zededa, will also share some insights on the subject.

The application story section features nine case studies that demonstrate real-world applications of smart monitoring and management. One of the case studies explores how the Shanghai Lingang Pilot Free Trade Zone adopted Advantech's iBuilding smart building management solution in an effort to implement real-time energy monitoring and management for smart parks. Another examines how Advantech helped a distribution system operator improve electricity grid monitoring and management via a large-scale deployment of substation smart wireless routers that augment communication.

In the Customer Partnership column, Mr. William Tan, Managing Director of Mirai Electronics, writes about the collaboration cycle created by Advantech and Mirai Electronics. Advantech has provided a wide range of edge computing devices, AI solutions, wireless connectivity solutions, embedded boards, industrial peripherals, and customization services that have enabled Mirai Electronics to implement its corporate vision. As strategic partners, the two companies have collaborated on producing high-quality solutions that improve Singapore's green energy development.

The need for smart energy monitoring and management solutions will grow in correlation to the rising popularity and consumption of sustainable and/or renewable energy. As a leading automation and IoT industry vendor, Advantech is committed to working closely with its ecosystem partners to create and enhance smart energy solutions that yield mutual benefits and contribute to achieving a sustainable planet. ■

# Advantech Tackles Energy Demand Challenges with Ecosystem Partners in ASEAN

Advantech Vietnam and its ecosystem partners cooperated on providing smart technologies to several customers, including Vietnam Electricity (EVN). These technologies facilitated digital substations, smart energy management, and renewable energy applications.

**Photos provided by Advantech**
**Interview with Mr. Ngo Viet Hai, Sales Director of Advantech Vietnam**

At present, 320 million people in the ASEAN region live in cities. The United Nations Environment Programme (UNEP) estimates that another 205 million people will move to cities by 2050, increasing the urban population to nearly 525 million. Urbanization will bring economic growth as well as challenges related to competition for limited resources, environmental degradation, and health.

Mr. Ngo Viet Hai, Sales Director at Advantech Vietnam stated, “ASEAN countries are some of the world’s most desirable investment destinations. Conservative estimates from the ASEAN Centre for Energy indicate that fueling this growth will double the demand for primary energy from 625 MTOE in 2017 to 1,589 MTOE in 2040. Urbanization and industrialization creates energy demand challenges related to sufficiency, security, accessibility, affordability, and sustainability. Indicatively, approximately 70 million people in the ASEAN region still lack access to electricity.”

## Increasing renewable energy and building a sustainable future

More than ever, ASEAN countries need to address demand challenges by increasing the share of energy derived from renewable sources and establishing future sustainable energy models. Mr. Hai pointed out that integrating urban systems with smart technologies, like IoT and cloud computing, is vital to further overcoming these challenges. Advantech, an IoT leader, has regional business units in five ASEAN countries. These units help both the public and private sectors embrace digital transformation, including data-driven, technology-enabled energy and environment practices in an effort to tackle a range of urbanization issues. For many years, Advantech has assisted customers with leveraging IoT and cloud services for real-time data collection, analytics, visualization, remote monitoring, and management.

Advantech has also promoted the use of AI and machine learning in the provision of predictive maintenance. Mr. Hai added, “We offer diverse products and services that include add-in and I/O modules, intelligent RTU, cloud servers, SCADA servers, software, and the WISE-PaaS platform. We even integrate different technologies and protocols for energy and environment management.

## Focusing on the energy market’s four sub-segments

Advantech’s 2021 business plan for ASEAN focuses on the power and energy market’s four sub-segments. These sub-segments are digital substations, energy management, renewable power generation, and wind turbines. Advantech predicts that the compound annual growth rate (CAGR) for the digital substation segment, the segment with the highest growth potential, will increase to 7.1% by 2025. The CAGR of the renewable power generation segment is expected to be the highest in 2025, reaching 20.5%.

There are numerous types of power plants in ASEAN nations, but increasing the share of renewable energy reduces carbon emissions. Tellingly, Vietnam reported the highest solar investment growth rate among ASEAN countries in 2020. Mr. Hai emphasized that Vietnam focuses on three energy applications — digital substations, smart energy management, and renewable energy.

These applications utilize online monitoring and management-related hardware and software products. The biggest end-customer in Vietnam is EVN, a state-owned company. Because energy is a design-in business, Advantech Vietnam cooperates closely with domain-focused systems integrators, and key players like EVN, in an effort to create an ecosystem and deliver turnkey solutions. Doing so enables Advantech and its ecosystem partners to accommodate EVN policies, regulations, and technical specifications upon release. As of 2021, the control center server room and about 80% of digital substations in Vietnam use Advantech’s products including the ECU-4000 series of fanless rackmount box PCs.

Advantech Vietnam also assists customers in smart construction and solar farm management projects. One customer adopted Advantech’s ECU-1000 RISC-based industrial communication gateway to collect data from 200 smart power meters. This data was uploaded to cloud servers to enable categorization, visualization, and analysis of data from different buildings in various provinces. Because the Phase 1 results were encouraging, during Phase 2 of the project next year, 2,000 more power meters will be added.

Mr. Hai commented, “This year’s goal for the Vietnamese market was US$1 million in revenue. EVN alone has contributed nearly 70% of this goal.” For the next three years, Advantech’s ASEAN business units will work towards exploring power distribution and renewable energy applications that require energy management solutions. They hope to contribute up to US$3 million in revenue by 2025. ■

# Modernizing Aging Electrical Grids Through Digital Transformation

Governments around the world and the energy industry are facing an urgent and daunting challenge: How to modernize and digitalize antiquated electrical grids.

**Photos provided by Shutterstock**
**Source: Speaker Excerptions from InnoTalks' "Digital Transformation at Scale: Modernization of the Aging Electrical Grid" and Advantech Connect "Substation Digitalization and Smart Grid Automation"**

In recent years, as the world unites to combat climate change, the energy industry has faced drastic changes that have outpaced the modernization of the electricity grid. In many ways, the current electricity grid is antiquated. For example, in the past grids only needed to support one-direction electricity flow. Now, grids need to accommodate consumers with solar panels that produce excess energy and require support for bi-directional electricity flows. This phenomenon has changed the relationship between the electrical grid and the consumer. Accordingly, countries around the world are seeking to digitalize their power generation and supply infrastructure.

## Drivers and challenges in the power sector

Electrical grids are extremely dense ecosystems. When one thing goes wrong, the problem can snowball into other parts of the system. As the world moves away from traditional energy sources towards greater sustainability, increased pressure is placed on the grid. Indeed, as traditional grids continue to age, soon they will be unable to meet consumer demands.

Prithpal Khajuria, Global Segment Leader of the Power Sector in the IoT Group at Intel, revealed his views on the inadequacy of the electricity grid, highlighting two aspects in particular. First, the emergence of renewable energy has resulted in bi-directional electricity flows on the grid, which is causing imbalances. Because some renewable energy resources are dependent on specific weather conditions, these "renewables" can be considered unstable sources of energy. Without advanced management, reliance on these sources could lead to serious problems.

Second, the growing electrification of the transportation sector may quadruple energy demands over the next decade. Such a surge in demand may cause significant problems for grids that were not designed to handle such loads. Accordingly, the energy and utility industries may need to rethink how they manage, operate, and maintain grids in the future.

In addition to these technological challenges, there are issues concerning the utilities business model. "If more people produce and store their own energy, becoming more self-sufficient, utility providers will need to find new business models that accommodate for this shift in supply and demand; otherwise, the economics of operating a grid might fail," asserted Jason Shephard, Vice President of Ecosystems at Zededa. Therefore, the industry requires a more intelligent system of

operations in order to overcome the grid issues currently arising.

## Modernizing and digitalizing the electrical grid

There are two approaches to addressing the challenges created by changing the electricity grid landscape and promoting digital transformation. One option is to build additional custom infrastructure, which is likely to be expensive, complex, and time-consuming. Comparatively, the more feasible and preferable option is to rely on new technologies such as the IoT, virtualization, and edge intelligence.

With regard to the latter option, Khajuria elaborated further, "The first step is the modernization of automation and controls; the second is cybersecurity. With these two steps in mind, it is paramount that utility providers begin to modernize infrastructure and participate in active grid management with data-driven and autonomous decisions. This means introducing edge intelligence to substations and building modern infrastructure at the edge. The result will transform the electricity grid into a grid of microgrids on a system of systems that is more intelligent than ever before. The built-in intelligence will provide management with greater insight into daily operations and future initiatives."

"The best way to transform the electricity grid is to use a data-centric approach," stated Khajuria. He explained the two steps involved in this approach. The first is to use the power of AI analytics and machine learning to extract intelligence. The second step is to embrace a standardized approach for seamless configuration.

Digitalization enables utility providers to reduce operation and maintenance costs by 76% and may deliver the following four significant benefits. Firstly, digitalization can reduce capital expenditure because the amount of hardware required is reduced. Secondly, it can significantly improve the manageability of applications and dramatically reduce field maintenance costs. Thirdly, it enhances system security. Finally, it can improve the ease of operation and maintenance of utilities across the board.

In summation, when considering the long-term impact, digitalizing the grid and implementing edge intelligence in substations is a sustainable and green way to improve future power generation. ■

# ITRI and Advantech Assist Water Purification Plant with Digital Transformation

Together with Advantech, the Water Technology Research Division of Taiwan's Industrial Technology Research Institute (ITRI) has assisted a water purification plant with digitalizing the chemical water treatment process and resolving staff shortages.

**Photos provided by Shutterstock**
**Interview with Dr. Kuan-Foo Chang, Manager, Water Technology Research Division of ITRI; Chih Huang, AIoT Engineer, Water Technology Research Division of ITRI**

Water is a precious resource with supplies coming under pressure in many countries due to fast-growing populations and pollution from municipal, agricultural, and industrial waste. Compounding the issue, global warming has intensified droughts in many regions, causing at least US$124 billion in economic losses and affecting more than 1.5 billion people between 1998 and 2017, according to a 2021 U.N. report. This prompted several governments to initiate special water treatment and conservation programs to tackle droughts and the deteriorating clean water environment.

Dr. Kuan-Foo Chang, Manager at the Water Technology Research Division of ITRI commented, "Using smart water management solutions that leverage the latest technologies, such as IoT and AI, to achieve sustainability has become a trend.

In Taiwan, ITRI's Water Technology Research Division has always been at the forefront of efforts to transition from automation to AI-powered smart water solutions. Their main task is to develop future-proof solutions that will help private and public organizations in three aspects: environmental regulatory compliance, carbon footprint and energy consumption reduction, and smart control and management."

## Accumulated industry knowledge facilitates the co-creation of smart water solutions

Since 2018, Advantech has cooperated with ITRI on several water resource management and treatment projects ranging from simple coagulation–flocculation chemical water treatment to complicated biological treatment processes. Leveraging their accumulated industry knowledge, they created the IWS-41A Intelligent Water Treatment Management Solution Suite — a real-time monitoring and management platform for data acquisition, aggregation, visualization, and AI analysis. IWS-41A is adaptable and scalable, allowing AI algorithms and visualization modes to be easily modified according to customer requirements.

Recently, with increasing awareness of digital transformation in the water industry, a water purification plant in southern Taiwan commissioned ITRI to develop more efficient methods and tools for water management. Because water purification plants and distribution reservoirs are often located in remote areas, the most common challenges faced include staff shortages, equipment maintenance, and managing time-intensive coagulation processes. Raw water parameters (e.g., pH levels, turbidity, and suspended solids) derived from jar testing twice daily are considered when determining the coagulant dose for a given day. However, for water treatment operators, the three hours required to commute to and from the water purification plant, combined with the two hours required for jar testing, leaves minimal time for equipment maintenance.

## Real-time water parameters enable dynamic coagulant dosing

After a site evaluation and consultation, ITRI proposed a smart integrated solution comprising an automated dosing machine, AI analytics data, and Advantech's IWS-41A intelligent water treatment management solution suite. The solution is used to collect and analyze raw water parameters every 15 minutes and adjust the coagulant dose according to the real-time water parameters. This has made coagulant dosing considerably more accurate and responsive, while also optimizing the coagulation–flocculation, mixing, and sedimentation processes. Mr. Chih Huang, AIoT Engineer at the Water Technology Research Division of ITRI, pointed out, "In contrast to previous time-intensive procedures, the integrated smart water management solution executes the coagulation–flocculation process automatically using AI analytics. This means operators only need to visit the purification plant twice per week for sensor calibration and equipment maintenance." Furthermore, because the raw water intake quality and volume fluctuate constantly, the dosing machine must be in operation 24/7. Previously, operators used more coagulants than required to guarantee that the finished water quality met all standard requirements. However, with this innovative smart management solution, the water purification plant was able to reduce the amount of coagulant used annually by 5%, thereby reducing the overall operating costs.

Looking to the future, Advantech and ITRI plan to continue refining this smart water management solution and promoting it to other water agencies. Dr. Chang asserted that they are also exploring wastewater treatment solutions, which typically require advanced biological technologies and sensors, and thus represent a higher initial investment for businesses.

They hope to learn more about creating an efficient AI analytics system for wastewater management based on a few water parameters (e.g., dissolved oxygen) in order to create more desirable and cost-effective wastewater treatment solutions. ■

# Easy Control and Advantech's Smart Water System Benefits Taiwan's Regional Water Agencies and National Water Supplies

Easy Control and Advantech developed a smart water monitoring and management system that is compatible with different legacy PLC and HMI devices and ensures long-term stability to guarantee reliable water supplies in Taiwan.

**Photos provided by Shutterstock**
**Interview with Zhi-Yang Jian, CEO of Easy Control Technology**

Water supplies have a substantial impact on the economy and quality of life in Taiwan. With climate change causing increasing floods and droughts, efficient innovations are urgently required to achieve smart and sustainable management of water supply systems.

Mr. Zhi-Yang Jian, CEO of Easy Control Technology, knows that the quality of Taiwan's water supply is on par with that of any other advanced country. The automatic water quality monitoring systems, which use PLCs and analog sensors, were installed more than 20 years ago to monitor everything ranging from raw water intake to purified water distribution. "In recent years, many of Taiwan's regional water agencies' water utilities have reached the end of their lifecycle," Mr. Jian commented. "In line with the trend for digitalizing systems, water agencies have planned to upgrade their facilities gradually."

## System flexibility and scalability integrates differing PLCs and HMIs

Easy Control is a turnkey systems integrator that specializes in remote monitoring solutions, automation, and system design and implementation. Combining Advantech's APAX series controllers and DeviceOn/BI industrial IoT platform with Easy Control's in-depth industry knowledge and expert services, a smart remote water monitoring and management system was developed. Since its introduction to various regional water agencies in Taiwan several years ago, the system has become Easy Control's standard package for the water industry.

In 2021, a regional water agency in Southern Taiwan launched a project to upgrade more than

100 raw water monitoring substations. Over the years, the water agency implemented several different brands and models of PLCs and HMIs, resulting in operation and maintenance challenges, as well as on-the-job training difficulties. Additionally, the facility cabinets for these stations are located on roadsides and offer poor ventilation. This problem is compounded by Taiwan's sub-tropical weather, making it an extremely harsh environment for electronic systems. However, due to financial constraints, the water agency was not able to upgrade the controllers and other substation facilities all at once.

Mr. Jian explained that these substations were equipped with diverse PLC and HMI/SCADA devices that offered insufficient data acquisition rates for real-time water quality monitoring. Moreover, initially only 23 substations could be upgraded with Advantech's APAX series controllers for high-speed data acquisition, while the remaining substations had to implement basic equipment monitoring services. However, after the PLC and HMI systems were redesigned with the support of Advantech's flexible and scalable hardware and software, the various software interfaces and data formats could be integrated.

## A sustainable business model benefits stakeholders

Designed for industrial automation applications, the APAX series controllers offer rapid data processing performance and stable operation at temperatures in excess of 50 °C/122 °F. Furthermore, Advantech's DeviceOn/BI platform enabled Easy Control to execute real-time asset monitoring from a web-based portal. In addition to real-time event notifications, this portal provided a comprehensive work order process that allowed equipment failures to be reported via a phone app and evidenced with descriptive texts, photographs, and videos. Records of repaired/replaced parts and equipment could also be analyzed to obtain critical insights for future maintenance and service planning.

Additionally, the innovative smart water monitoring and management system saved the water agency a tremendous amount of time by enabling remote inspections and eliminating unexpected equipment shutdowns. This enabled the agency to consolidate the staff of two control rooms into a single team for improved human resource allocation. The unified interfaces designed by Easy Control had clear SOPs for guiding operators through various tasks, reducing training times for both existing and new employees.

Advantech provides comprehensive hardware and flexible software with long product lifecycles and technical support. After comparing newly installed systems to newly purchased cars, in that typically no major issues arise during the warranty period, Mr. Jian asserted "for water agencies, the supply of water is a 24/7 non-stop operation that continues long after the warranty period. Our goal is to provide a sustainable business model that facilitates the implementation of reliable systems and ensures their long-term operation to assist water agencies and ensure the reliability of Taiwan's water supply."

In the future, Easy Control and Advantech are keen to incorporate AI analytics into the water monitoring and management system in order to provide enhanced preventative maintenance functions. ■

# Advantech Implements Smart Wireless Routers for Substation Communication

Advantech assisted a distribution system operator (DSO) with the large-scale deployment of smart wireless routers for substation communication to enable electricity grid monitoring and management.

**Photos provided by Fotolia**

In an effort to reduce urban pollution and increase the use of renewable energy and electric vehicles, DSOs are upgrading power grids by introducing monitoring and management systems that balance power generation while ensuring resilience, reliability, and security. Considering the infrastructure required for such management systems, communication technology is essential. Indeed, for automation and control, and for linking components within the grid, reliable communication technology is vital.

Accordingly, Advantech recently delivered a complete grid monitoring communication solution to a renowned DSO. This solution enables the DSO to rollout thousands of systems simultaneously by providing high reliability, flexible expansion options, stringent security, easy installation, and scalability.

## Advantech's complete communication solution overcomes challenges

The DSO in this case has over half a million customers and 100,000 kilometers of cables. In an effort to remain competitive and at the forefront of the market, this DSO planned an initial upgrade of 1,000 remote sites, with the goal of upgrading 5,000 sites over the next decade. This necessitated upgrading their grid management communication system to ensure reliable communication between different substations, switching stations, interconnected sites, and distribution locations. Their goal is to maintain energy supply security, with a target of 99.99% security of supply.

For this project, because many of the installation sites were unsuitable for cables and wired connections, the DSO required a wireless solution for the upgrade. This would allow the company to conduct real-time monitoring, while ensuring reliable performance and availability once operational. This was especially true for high-priority sites, such as switching stations and substations, which necessitated greater availability. Because security is vital for communication systems, the solution also needed to have a robust cyber security protocol that could protect the network and conform to critical infrastructure security audits. Finally, the solution needed to be easy to install to enable field engineers to complete the installation without special training regarding device configuration and/or commissioning. The DSO adopted Advantech's comprehensive grid monitoring communication solution not only because the solution satisfied all their requirements, but also because of Advantech's reputation for quality products, reliability, and consistent after-sales service.

## Accelerating communication upgrades with smart wireless routers

In response to the DSO's goal of deploying reliable and secure wireless communication networks, Advantech designed a solution that would simplify the installation process, enabling the upgrading of 1,000 substations within one year.

The solution comprised three wireless routers deployed to provide grid monitoring connectivity. An Advantech SmartMotion router was deployed at high-priority stations. This router offered two simultaneously active cellular connections from two different service providers via two SIM cards to ensure maximum availability. Moreover, a wired connection to a satellite (VSAT) link was also provided at high-priority sites to serve as a failsafe link. At lower priority sites, either a SmartStart or SmartFlex router was deployed depending on the available connections to local monitoring systems. Although this less aggressive approach provides only one active cellular connection, it utilizes dual SIM cards to ensure a failsafe is available with a backup service provider should issues arise with the primary service provider.

Other challenges involved network security, monitoring, management, and provisioning. Each physical site needed to support communication with two centralized management sites via dual encrypted links. Likewise, the status of the routers at remote sites was monitored using popular third-party software to ensure that the service level agreement (SLA) would be met.

Accordingly, Advantech's software development team modified the standard router software to support two active encrypted links via the Simple Certificate Enrolment Protocol (SCEP). In order to ensure regular certificate renewal, the routers were integrated into an SNMP-based third-party monitoring system to provide necessary data for SLA monitoring.

With a zero-touch provisioning system that automatically links the router to the centralized management system upon first power-up, Advantech was able provide a simple solution that could be quickly installed without the need for on-site configuration, drastically reducing installation costs.

In conclusion, Advantech's innovative solution for substation communication delivered the flexibility, scalability, and reliability needed to accelerate the DSO's power grid upgrade. ■

# LUCOM and Advantech Collaborate to Provide Secure Mobile Connectivity for Smart Distribution Transformer Terminals

LUCOM GmbH and Advantech provided state-of-the-art industrial IoT LTE routers to a leading European energy solutions provider for a project involving 9,000 smart distribution transformer terminals in the Middle East.

**Photos provided by Shutterstock**
**Interview with Jens Hilgner, CEO of LUCOM GmbH**

Contemporary energy networks include many high-, medium-, and low-voltage stations and substations that manage energy generated by multiple sources, such as nuclear power plants, wind turbines, and solar PV farms. This results in multidirectional power flow within the power distribution system, instead of the traditional one-way power flow from upstream power plants being delivered directly to consumers. However, the intermittent nature of renewable energy sources necessitates improved integration and management within smart grids. From energy generation through to distribution, every process must be monitored and managed carefully to ensure sufficient and stable power supply.

IoT technology is crucial to enabling the integration and centralized management of modern energy infrastructures. LUCOM GmbH, a German IT solutions provider, leveraged Advantech's cellular routers and gateways to provide reliable M2M connectivity for smart grid facilities and systems. This enabled complex power network automation tasks to be conducted easily, while ensuring optimal uptime.

## Professional consultation and timely support fulfill project requirements

A leading European energy solutions provider that produces intelligent systems for energy distribution error detection consulted LUCOM for a project involving 9,000 smart distribution transformer terminals in the Middle East. The energy operator wanted to consolidate their infrastructure for fault detection and data collection with rugged communication solutions that can be centrally managed over 4G LTE and 3G networks and protected from unauthorized access.

Having worked with Advantech for over a decade to deliver many successful IoT projects, LUCOM GmbH selected Advantech as the hardware partner for this project. Key reasons supporting this decision were Advantech's ability to provide proven solutions, long-term warranty, component longevity, and worldwide aftersales support. Meanwhile, to accommodate the customer's transformer terminal design, Advantech proposed a customized solution based on its ICR-3231 industrial IoT LTE router and gateway. During the development stage, LUCOM GmbH provided technical consultations regarding mobile network specifications, system interface, product training, and programming. LUCOM GmbH's management of the project ensured that the customer's requests were communicated to Advantech clearly and quickly, allowing the technical team to make timely modifications accordingly.

The customized ICR-3231 router and gateway provides access to all ports as well as a SIM card slot in the front panel for easy integration and maintenance. Moreover, any unused ports were removed to eliminate risk of malfunction or failure. The inclusion of a wide operating temperature range (-40 ~ 75 °C/-40 ~ 167 °F) was particularly critical for ensuring stable operation in the climate of the Middle East. Overall, Advantech's ICR-3231 router provided reliable wireless connectivity and security while supporting VPN connections and software-based firewalls.

Integrated with an ICR-3231 router, the smart distribution transformer terminals allowed the customer to establish a closed and secure communication infrastructure via VPN. By preventing outgoing Internet access and unauthorized incoming access to terminals, the solution helped maintain the integrity of the energy network. The integrated solution also collects valuable data from the transformers and sends email or SMS notifications to a centralized control room if a fault is detected, thereby reducing the human resource requirements for monitoring the transformers.

## A reliable partner complements technological strengths and industry expertise

LUCOM GmbH and Advantech have had a very fruitful partnership for more than 10 years. Mr. Jens Hilgner, CEO of LUCOM GmbH, commented that, "Regular and intensive information exchanges, open and trusted collaboration, a problem-solving approach, and a shared commitment to satisfying project requirements were how we overcame difficulties during the project."

LUCOM GmbH used to develop its own router devices for IoT applications. However, the company soon realized that collaborating with a reliable partner that complements their technological strengths and industry expertise is the fastest strategy to achieving the successful future  they envisioned. This has allowed them to concentrate on customer service and supporting their software offerings, such as the Digicluster VPN portal solutions.

Demand for renewable energy is expected to increase due to growing environmental awareness, resulting in a need to connect ever greater numbers of devices. However, finding suitable solutions can be challenging, which is where LUCOM GmbH and Advantech came in.

Because the market demands high-quality industrial routers for collecting data from facilities and stations in smart grids, both LUCOM GmbH and Advantech will have more opportunities to win new projects. With Advantech's full support, LUCOM GmbH will continue offering state-of-the-art connectivity solutions to an exclusive selection of valuable customers. ■

# Actility, AWS, and Advantech Leverage Combined Strengths to Co-Create a Predictive Maintenance Solution

To help a leading crude oil refining company in Asia overcome the growing challenges associated with manual inspections and excessive maintenance costs, Actility, AWS and Advantech have collaborated to develop an off-the-shelf pre-integrated predictive maintenance solution.

**Photos provided by Shutterstock**
**Interview with Alban Medici, Managing Director of Actility Singapore**

Industrial refineries are very large complexes that involve numerous processing units and auxiliary facilities such as crude oil distillation units, vacuum distillation units, heat exchangers, cooling towers, and other large machines. These facilities are dispersed over a vast industrial area, with some equipment installed in hazardous environments or nearly inaccessible locations, making maintenance extremely difficult. Between 2006 and 2017, the U.S. Department of Energy reported 1,700 shutdowns at petroleum refineries, of which 46% were due to mechanical breakdowns and 23% were due to maintenance issues. Unplanned shutdowns can be extremely costly, to the extent that preventing even a few shutdowns can save millions of dollars.

Recognizing the oil refining industry's huge business potential, Actility, AWS, and Advantech leveraged their combined technological strengths and developed an off-the-shelf pre-integrated predictive maintenance solution. Alban Medici, Managing Director of Actility Singapore, commented that by integrating IoT, machine learning, and predictive analytics, the proposed maintenance solution is able to not only reshape daily operations at refineries, but also increase efficiency, safety, and ultimately profit margins.

## LoRaWAN® network offers reliable connectivity between smart sensors and gateways

A leading crude oil refining company in Asia recently approached Actility to assist with its digital transformation. The refinery was hoping to overcome the growing management and operational costs and challenges related to manual inspections and maintenance. Because of the refinery's large premises and long list of equipment that needed monitoring, installing sensor node hardware on local gateways would have proved too costly. Moreover, considering the many metal surfaces throughout the premises that hinder cable installation, all sensors and monitoring equipment needed to be non-invasive and easily installed. Wireless communication technologies also needed to be utilized to ensure reliable connectivity. Furthermore, to satisfy relevant safety requirements, all devices and gateways had to be suitable for use outdoors and in hazardous environments.

Of all the equipment at the refinery, rotating machinery (e.g., pumps, motors, and compressors) is the most frequently used and requires the most maintenance. Indeed, a single crude oil unit may have 30 to 40 different types of pumps. With this in mind, a solution comprising Advantech's WISE-2410 LoRaWAN® smart vibration sensor integrated with Actility's ThingPark Enterprise IoT platform was proposed to the customer.

Actility's enterprise-grade LoRaWAN network server is the leading LoRaWAN private networking solution, managing over 35,000 commercial gateways worldwide. Utilizing this server, a dedicated and fully controlled LoRaWAN network was deployed at the refinery. This enabled all network components, including sensors, gateways, and routers, to be managed from an easy-to-use interface. Furthermore, ThingPark Enterprise equipped the AWS IoT cloud platform with various connectivity options to facilitate AI-based analysis of pump equipment and predictive maintenance tasks.

## ATEX, IECEx, and ISO 10816-3-compliant turnkey solution for hazardous environments

To assist the refinery with managing its facilities, the innovative predictive monitoring solution was integrated with the AWS IoT cloud platform through digitally twinning. Using the LoRaWAN network server's built-in network mapping and troubleshooting tools together with Abeeway's hazardous network checker, site surveying and deployment were completed within a short amount of time. Because installing and calibrating WISE-2410 sensors only required a few hours, the refinery was able to visualize acquired data on AWS IoT SiteWise the very same day.

Advantech's WISE-2410 vibration and temperature sensors are IP66-rated for ingress protection and ATEX- and IECEx-certified for use in hazardous environments and explosive atmospheres. These sensors were mounted on all rotating machinery to detect operational status through cross-comparisons of RMS speeds and eigenvalues against ISO 10816-3 standards and characteristic vibration values. Equipped with LoRaWAN, the turnkey predictive maintenance solution offered long-range (up to 15 km) bidirectional communication between sensors and gateways, reducing the number of field devices that needed to be installed.

Overall, the co-created predictive maintenance solution improved productivity, reduced staffing requirements, and increased revenue. The refinery is now able to remotely monitor rotating equipment, regularly record utilization data, and conduct centralized management from any location and at any time via AWS IoT dashboards — all in real time.

Regarding the future, Actility and Advantech plan to continue developing ready-to-use solutions for the oil and gas industry and using their extensive distribution networks to appeal to various customers. Both companies hope that this will put them in the best position to win future business. ■

# Advantech Implements SCADA Monitoring Solution with OPC UA Support at Gas Stations in the Middle East

Advantech has helped a systems integration partner to assist a gas chain supplier with implementing a centralized SCADA system at gas stations in the Middle East to improve operational efficiency and management with the inclusion of intelligent features.

**Photos provided by Shutterstock**

In contemporary gas stations, the simple act of refueling involves the use of many automated parts and sensors that expedite refueling and prevent fuel leakages. However, this process has the potential to impact the environment, worker health, and even create additional safety issues. Accordingly, many gas station chains have implemented centralized SCADA systems with intelligent functions that enable remote asset monitoring and management.

In the Middle East, one of Advantech's ecosystem partners won a contract to modernize the OT and IT infrastructure of a renowned gas station chain. To enable monitoring of operations and environmental conditions in real time, a SCADA system was built using Advantech's ADAM series of data acquisition I/O modules and all-in-one intelligent remote terminal units (iRTUs). With support for the Open Platform Communications Unified Architecture (OPC UA) protocol, this system offered the most cost-effective monitoring solution, as well as unparalleled data security.

## Advantech's solution improves management efficiency and data security

Traditionally, sensors and automatic controls at gas stations rely on serial communication, with RS-232 or RS-485 interfaces and the Modbus protocol widely used to ensure cost-efficiency and easy deployment. However, because Modbus is not the optimal choice for data security, data is at high risk of compromise during acquisition and transmission to the cloud. Thus, a solution was designed to effectively acquire and transmit on-site data to the cloud in an IoT-compliant and security-enhanced format.

Advantech's solution comprised the ADAM-3600 all-in-one iRTU (supports OPC UA), ADAM-4000 serial I/O module, ADAM-6200 Ethernet I/O module, and UNO-410 explosion-proof gateway. ADAM-3600 combines the functions of a computer, modular I/O system, and IoT gateway into an exceptional all-in-one design that significantly reduces deployment costs and integration obstacles. Equipped with Advantech's WISE-EdgeLink gateway software, the ADAM-3600 all-in-one iRTU is compatible with various protocols, including Modbus, Ethernet, MQTT, and the newly added OPC UA.

For this project, Advantech recommended installing ADAM-4000 modules for collecting sensor data from underground tanks in order to detect gasoline leaks and possible soil contamination. This is one of the most economical solutions available for analog data acquisition in the field. Advantech also recommended deploying ADAM-6200 Ethernet I/O modules for detecting underground water contamination and other types of environmental pollution. Because ADAM-6200 can support a daisy-chain configuration with automatic bypass, these modules ensure easy setup, reliable transmissions, and versatile scalability.

After collection, all acquired data is sent to the UNO-410 gateway via the Modbus protocol. This rugged gateway is designed to withstand explosions, making it ideal for deployment in hazardous environments such as gas stations. Next, the ADAM-3600 module installed in the gas station office collects data from UNO-410 and converts it into secure OPC format for upload to the remote SCADA server, which features encryption and sign-in certification.

## Expandability and versatility for various sectors

In addition to gas stations, this comprehensive monitoring solution can be deployed for other public utilities, such as water, power, and natural gas. All public utility services involve the maintenance of numerous remotely distributed assets. The OPC UA protocol is ideal for utility companies that are still developing a SCADA system for facility monitoring and digitalizing IoT assets. This is because the protocol unifies and converges OT and IT with innate security features. The open platform architecture also provides universal access for connecting various cross-platform devices. As well as high scalability, the OPC UA offers a timestamp feature that ensures accurately sequenced data points, which is crucial for data analysis.

As the world's leading IoT expert, Advantech provides a complete array of products that support OPC UA and other protocols. This gives customers in different sectors the flexibility required to design and build the most reliable solution possible. By providing rapidly deployed solutions and exceptional after-sales service, Advantech will continue to promote a digital transformation across diverse industries. ■

### Advantech's Solutions and Application Benefits

1. **Real-time monitoring of operations, site facilities, and environment**
2. **Enables precise data acquisition and premium data security**

# Water Company in Xi'an Benefits from Advantech's IoT Solutions for Smart Water Management

A water company in Xi'an, China, has upgraded its equipment with Advantech's smart water management solution to promote digital transformation and ensure a high-quality water supply for the city.

**Photos provided by Shutterstock**

Many people take having a clean supply of water for granted. However, the process of producing clean water and keeping the supply uninterrupted is difficult. Indeed, it involves complex processes and operations and requires careful maintenance. In particular, as urban water supply systems age, the chance of system and equipment malfunctions increase substantially, and potentially result in unpredictable water waste and leaks, which invariably causes interruptions, inconveniencing millions of consumers.

Seeking to safely and conveniently bring water to city residents, the Xi'an City Government initiated a program to improve its water supply service quality. It aimed at changing the fundamentals of the water supply system in Xi'an by adopting IoT technology. This technology will be used to monitor equipment operational statuses in every water supply station in the city. The city government commissioned the water company to oversee the entire program and solicit specialist vendors to carry out the program. Among the various vendors that were considered, Advantech was selected to provide communications technology and various services for the new project.

## IoT technology overcomes distribution challenges

Xi'an's water supply system consists of numerous large water pumps, motors, and control centers and/or stations. These presented challenges including high temperatures, humidity, and electromagnetic interference. Older equipment was installed in environments with extreme heat and humidity; and/or where high-power motors, operating for long periods, created electromagnetic interference. In addition, the enclosed design of the centers' control cabinets labored to dissipate heat.

The combination of these harsh conditions tested the equipment's durability. Therefore, real-time monitoring of each piece of equipment was needed to create  efficient water resource operation. Real-time monitoring enables preventive maintenance to ensure prompt support and repairs that reduce downtime. A stable and reliable network was essential in making this system work. Advantech's streamlined, decentralized, and multi-protocol communication system empowered the smart water management system and improved water management efficiency.

## Realizing real-time monitoring with smart water management

For this smart water management system, Advantech provided an EKI-7000 series managed Ethernet switch and ECU-1251 smart gateway. The EKI-7000 served as a communication device for interlinking PLC controllers and communication meters to enable secure network transmissions. Designed to the toughest industrial-grade standards, these devices feature strong shielding against electromagnetic interference and support eight gigabit Ethernet ports, four SFP optical fiber ports, and a wide operating temperature range (-40 ~ 75 °C/-40 ~ 167 °F).

A variety of communication protocols accommodate the many different brands of equipment installed at the plant. The ECU-1251 works with Advantech's WISE-EdgeLink and custom-made water management software, which provides multilayer protocol resolution and integration. These software are designed to work efficiently with various types industrial hardware in harsh environments. They support network ports that can be connected with the EKI-7000 and network security all-in-one (AIO) PC for transmitting the processed data between the two devices.

More specifically, data acquired from the on-site equipment is analyzed and transmitted to the network security AIO PC and then uploaded to the cloud platform. All the statuses and conditions of the water supply platforms for the entire city can now be managed and controlled remotely by water company administrators.

With the help of IoT technology, citizens in Xi'an enjoy cleaner, uninterrupted water supplies. The water company plans to share its experience implementing Advantech's smart water management solution with relevant water resource authorities in other cities. They hope doing so will help improve their water supply systems. Advantech will continue to utilize its 30 years of professional experience in an effort to collaborate with more partners from diverse sectors and promote a smarter, more sustainable society. ■

### Advantech's Solutions and Application Benefits

**Advantech's EKI-7000 managed Ethernet switch combined with an ECU-1251 smart gateway can be used in various sectors to improve the stability and efficiency of IoT applications. For example, the application in this project allowed the water supply platforms of the entire city to be controlled remotely from a single unified system.**

# Advantech Collaborates with TC Intelligent Technology to Enable Centralized Monitoring of Computer Facilities

A scientific research institute located in Taiwan implemented an intelligent building management system (IBMS) based on Advantech's WISE-PaaS platform. The system enabled unified management of geographically dispersed devices, significantly improving management efficiency through 3D data visualization and AI-based predictive diagnostic analysis.

**Photos provided by Advantech**
**Interview with Ben Shiue, Product Manager of Advantech; Jonathan Chen, General Manager of TC Intelligent Technology**

AI computing, big data analysis, and other cutting-edge technologies are leading the way for today's technology. To accelerate the application of high-speed computing, cloud networking, and big data analysis in a greater number of sectors, an undisclosed scientific research institute located in Taiwan is committed to providing high-performance processing, storage, networks, platform integration, and big data analysis services. In addition to establishing a large-scale computing center at its headquarters, the institute also set up several branches with computer facilities in various counties and cities in Taiwan.

Because the construction schedules, contractors, and equipment differed at the institute's various branches, on-site operations and maintenance personnel, and computer facility operators had to use different systems to perform tasks such as CCTV monitoring and access control. This approach increases the difficulty of executing operations and maintenance and the time and resources needed for management tasks. To address this issue, the institute commissioned TC Intelligent Technology to implement an IBMS based on Advantech's WISE-PaaS Industrial IoT platform to enable centralized control of its infrastructure, energy consumption, patrol and inspection schedule, and work orders, significantly increasing operational efficiency.

## Reducing workloads with low-code configuration and system integration

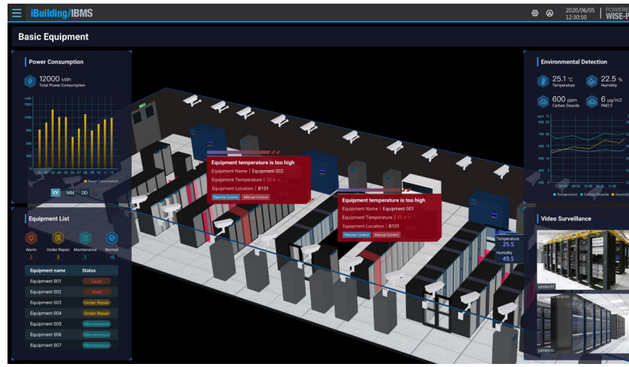
During the project's implementation, Advantech and TC Intelligent Technology proposed several key services based on the institute's needs. According to Ben Shiue, Product Manager at Advantech, Advantech and TC Intelligent Technology adopted a private platform deployment model to address information security concerns. Next, to satisfy the institute's need to use WISE-PaaS for secondary programming and development, all applications on the platform, including AI modeling, alarm notifications, and 3D modelling, adopt a low-code configuration for data binding. This reduces the workload of developers as well as operations and maintenance staff.

Furthermore, to establish a centralized management platform at the institute's headquarters, TC Intelligent Technology integrated various systems and subsystems aimed at management operations such as CCTV monitoring and access control. These integrated systems included Advantech's WebAccess/SCADA offerings and systems produced by Schneider Electric, Honeywell, and ACTi. The resulting platform solution eliminates the need for multiple systems and subsystems, and allows administrators to control all cross-regional computer facilities via a single interface. If operational abnormalities occur, the same platform can also be used to send event alarm notifications. This helps administrators avoid being distracted by receiving notifications from multiple devices.

Currently, the institute's computer facilities are available to many external users, such as government agencies, colleges, and universities. By adopting a centralized management approach, the institute can conveniently maintain all the computer facilities in real time, achieving a high availability rate of 99.99%.

## Combining AI, building information modeling (BIM), and digital twinning

Jonathan Chen, General Manager of TC Intelligent Technology, pointed out that by replacing the traditional SCADA graphics control systems with 3D modeling, on-site administrators can quickly identify problematic devices via data visualization. TC Intelligent Technology also converted the BIM model into an IFC file that was imported into WISE-IoTSuite/SaaS Composer, which is the WISE-PaaS platform's 3D visualization tool. This facilitated the centralized management of device configuration at the computer facilities and allowed on-site physical objects to be linked to digital twins.




With this setup, administrators can use a dashboard to easily monitor trends and changes to the environment and equipment parameters in real time, shortening response times and significantly improving operational efficiency. For example, in the event of an abnormality at any of the institute's computer facilities, administrators can immediately use the 3D-modelled digital twin to access the camera closest to the where the abnormality was detected. This allows them to visually confirm the equipment status, identify the potential cause of the issue, and take appropriate contingency measures.

More importantly, the WISE-PaaS platform's AI modeling and inferencing functions were used to construct an AIFS/PHM predictive diagnostics and analysis system for monitoring the air conditioning chiller system and water pump. With this system, if a potential fault is identified, a warning notification is sent to the relevant staff to conduct preemptive maintenance. So far, this has significantly minimized the patrol and inspection workload.

Overall, the close collaboration between TC Intelligent Technology and Advantech enabled the smart management of multiple, geographically dispersed computer facilities. Their combined efforts have assisted scientific research institutes, schools, and industrial factories with upgrading their infrastructure and achieving a more efficient digital transformation. ■

# Advantech's Smart Energy and Building Management Solution Reduces Costs and Improves Industrial Park Efficiency

Shanghai Lingang Pilot Free Trade Zone adopted Advantech's energy and building management solution in an effort to reduce costs and increase smart industrial park management efficiency. This solution implements real-time energy monitoring and green management for smart parks.

**Photos provided by iStock**

According to the International Energy Agency (IEA), buildings account for 33% of all global energy consumption. Likewise, their carbon emissions represent 40% of global totals. Because buildings are some of the largest energy consumers in the world, building-energy conservation is a vital factor in reaching energy and emission reduction goals. China has recently reiterated its commitment to adhering to its scheduled goals of peak $CO_2$ emissions by 2030 and carbon neutrality by 2060, as outlined in the country's overall energy conservation policy. Accordingly, the operators of the Shanghai Lingang Pilot Free Trade Zone are committed to creating a new generation of smart, self-sustaining, green industrial parks through the integration of emerging IoT and renewable energy technologies.

## Digitally twinning a digitalized smart industrial park

An industrial park faced multiple energy management challenges before they decided to implement a smart energy-saving solution. These challenges related to solar and wind power generation as well as the independent operation of other systems, such as energy storage, lighting, and air conditioning. Additionally, because equipment is typically scattered across a wide area, it cannot be managed via a single unified platform. This meant that locating malfunctioning equipment and identifying conditions on site and in real-time was extremely difficult. Accordingly, routine operations and maintenance relied primarily on time-consuming, laborious, manual inspections.

However, the implementation of smart energy-saving technologies helped to address these challenges. Indeed, distributed photovoltaic and wind power generation systems, as well as energy storage systems, were constructed on unused land in the park. These systems were combined with Advantech's smart energy management solution powered by the WISE-PaaS industrial IoT platform. This combination enabled the park to establish a new energy management solution and achieve effective energy management and control. Overall, the implemented solutions greatly improved the park's energy utilization rate while significantly reducing operating and maintenance costs.

The design of Lingang Industrial Park's energy management system was based on Advantech's WISE-InsightAPM app — a digitally twinned low-code platform under the WISE-PaaS suite. The solution is designed to support edge sensors that collect data from more than a dozen subsystems, including energy storage solutions, air conditioning systems, lighting systems, elevators, IT equipment, and distributed photovoltaic/wind power generation facilities. The park leveraged IoT and cloud technologies for unified control by facilitating the intelligent management of individual subsystems via a unified cloud management platform connected to different systems.

## Smart building management reduces labor costs by 40%

In contrast to the traditional operation of individual systems, Advantech's iBuilding smart energy and building management software supports the operation, control, and management of park systems and equipment via a single unified platform. For example, when the platform detects an abnormality on an air conditioning system component, it will locate the faulty device, send a notification via SMS or mobile app, and dispatch an operations and maintenance work order. All of these tasks are performed automatically by the system, minimizing human resource requirements and operations costs. These optimizations yield a 40% increase in building and maintenance efficiency, and a 60% decrease in complaints.

Since implementing the Advantech's smart energy and building management solution, Lingang Industrial Park saves up to 3,000 kWh of electricity per building per month. Moreover, $CO_2$ emissions have been reduced by 3 tons, roughly equivalent to the carbon absorption of 160 trees. Accordingly, this project marks a significant achievement in achieving buildings with low energy consumption and low carbon emissions.

Demand for energy and building management has grown exponentially alongside advancements in digital transformation. Advantech's smart energy and building management solution is also suitable for applications outside of smart industrial parks. Indeed, this solution has been deployed in medical institutions, residential communities, and commercial centers to enable centralized remote monitoring of building operations and maintenance.

In terms of the future, Advantech is committed to working towards a safer, more convenient, energy-efficient environment and will continue to work closely with its partners to expand energy management solutions to additional sectors and industries. ■

# Advantech's iEMS Solution Helps Industries Easily Inventory Greenhouse Gases

Advantech's iEMS Solution is an energy management platform that emphasizes practicality, ease of use, expandability, and scalability. It was designed to help organizations deploy smart energy management systems rapidly and at minimal cost, while also accommodating future growth.

**Photos provided by Advantech**
**Interview with Hans Lee, Business Development Manager of Advantech; Ben Shiue, Product Manager of Advantech**

According to the United Nations, global emissions of greenhouse gases must be reduced at least 45% by 2030 (relative to 2010 levels) to meet the long-term climate goals set out in the Paris Agreement. To this end, many countries and organizations have launched carbon neutral initiatives to assist individuals, businesses, and states to reduce their carbon footprint or reach for a net zero emissions target.

Mr. Hans Lee, Business Development Manager at Advantech, asserted that "global buyers' requirements for low-carbon manufacturing will impact the competitiveness of Taiwanese manufacturers in the international supply chain. Therefore, the purpose of deploying smart energy management systems is no longer merely to reduce energy costs, but also to demonstrate a commitment to environmental, social, and corporate governance (ESG) and net zero emissions efforts."

To keep up with the global trend for net zero emissions, low-carbon manufacturing, and smart low-carbon buildings, businesses must implement greenhouse gas (GHG) inventories. Advantech's iEMS Solution is based on its WISE-PaaS industrial cloud platform framework and was designed to help industries easily inventory GHG emissions. Tallying and analyzing the emissions that need elimination, and determining how that can be achieved, are important steps for achieving carbon neutrality. By emphasizing practicality, ease of use, expandability, and scalability, the iEMS Solution helps organizations not only deploy smart energy management systems quickly, but also cost effectively, with the scalability to accommodate future growth.

## Practical, flexible, and scalable smart energy management system

In recent years, Advantech has noticed growing demand for smart energy management solutions among hospitals, hypermarkets, big box retailers, universities, data centers, commercial buildings, factories, and industrial estates. These application sites have all previously implemented energy management systems for the purpose of reducing energy consumption. Indeed, these existing systems can help businesses save an average of 10% in electricity costs. However, when conducting GHG inventories, businesses can struggle to determine the total $CO_2$ emissions from all their facilities and operational activities. This is because they are still using multiple subsystems without a built-in GHG equivalency calculator. Additionally, the fact that these subsystems are geographically dispersed eliminates the possibility of analyzing big data to procure business insights and implement predictive maintenance strategies.

Advantech's WISE-PaaS platform provides a framework for microservices and data applications. Flexible and expandable, the architecture for this platform differs completely from that for Power SCADA, which adopts a clear and fixed database format. During the initial implementation, businesses and organizations may find it difficult to predict organizational changes that could occur in the next 5 to 10 years. Therefore, to accommodate their future needs, a flexible framework that uses microservices and data applications is required. Based on the WISE-PaaS framework, Advantech offers three infrastructure solution modules for visualization, digital twinning, and AI applications. Unlike other energy management solutions, the WISE-PaaS platform can accept both IT and OT data, such as data from sensors, controllers, PLCs, and IPCs. The digital twinning module can digitize data from various facilities and sources.

If AI analytics is required, corresponding algorithms can be applied to convert the data into AI models for edge deployment. Thus, the logic for the entire system architecture is that the data platform serves as a foundation for creating numerous microservices, such as real-time energy consumption monitoring, consumption statistical analysis, equipment diagnosis, and energy efficiency optimization.

Mr. Ben Shiue, Product Manager at Advantech, commented that Advantech's iEMS Solution offers customers a unified and scalable management platform that differs considerably

from traditional silo-based energy management systems. New sites can be easily added to the platform as required, allowing customers to conveniently conduct closed-loop management of all sites. This means corrective action can be executed based on real-time energy consumption results. For instance, if excessive energy usage is detected, the system will directly attempt to identify the cause and provide recommendations for improvements and optimization.

### Highly adaptable smart energy management system for various application sites

For hospitals, retailers, data centers, commercial buildings, and universities, the key motivation is to achieve ESG goals through energy management and environmental sustainability initiatives. Whereas for factories and industrial estates, their focus is on leveraging smart energy, facility management, and Industry 4.0 solutions to boost revenue, improve overall efficiency, and reduce production costs.

Consider a project by a world-leading passive components manufacturer as an example. The manufacturer's aims were to accurately determine production costs and realize predictive maintenance. By implementing Advantech's iEMS Solution, they can now calculate the energy consumption and carbon emissions values for individual work orders. Additionally, if the energy consumption of a machine exceeds a pre-set limit, the system automatically notifies the administrator and initiates appropriate predictive maintenance action. In regards to real-time reporting of GHG emissions, managers are informed whether overall carbon neutrality KPIs are likely to be achieved, enabling them to issue corrective actions if necessary.

Other examples include two recent hospital projects in Taiwan. One project involved a newly established hospital that integrated the WISE-PaaS platform into its systems from the building design stage. However, because hospital applications involve various spaces and components, such as boilers, elevators, wards, and operating rooms, they can be rather complex compared to other applications. Fortunately, the flexible structure of the WISE-PaaS platform allowed the hospital to implement the infrastructure needed for data collection, and develop microservices for energy and building management that could be added later.

Another project involved a hospital that comprised seven buildings, each equipped with various energy management systems. To meet government standards for energy usage and to achieve ESG goals, all the building subsystems, such as energy management and work order systems, must be centrally managed in order to accurately calculate energy consumption. Moreover, the new system needed to offer a finer level of data granularity than their existing systems to facilitate calculating the overall carbon emissions amount in metrics tons. Accordingly, the hospital decided to adopt the WISE-PaaS platform to guarantee a flexible and scalable system that allows for future expansion, gives an overview of all facilities, and protects against silo-based management.

Looking to the future, Advantech will continue developing iEMS Solution functions to include more digital templates for different equipment types while exploring innovations in renewable energy generation and storage, and moving toward the goal of net zero emissions. ■

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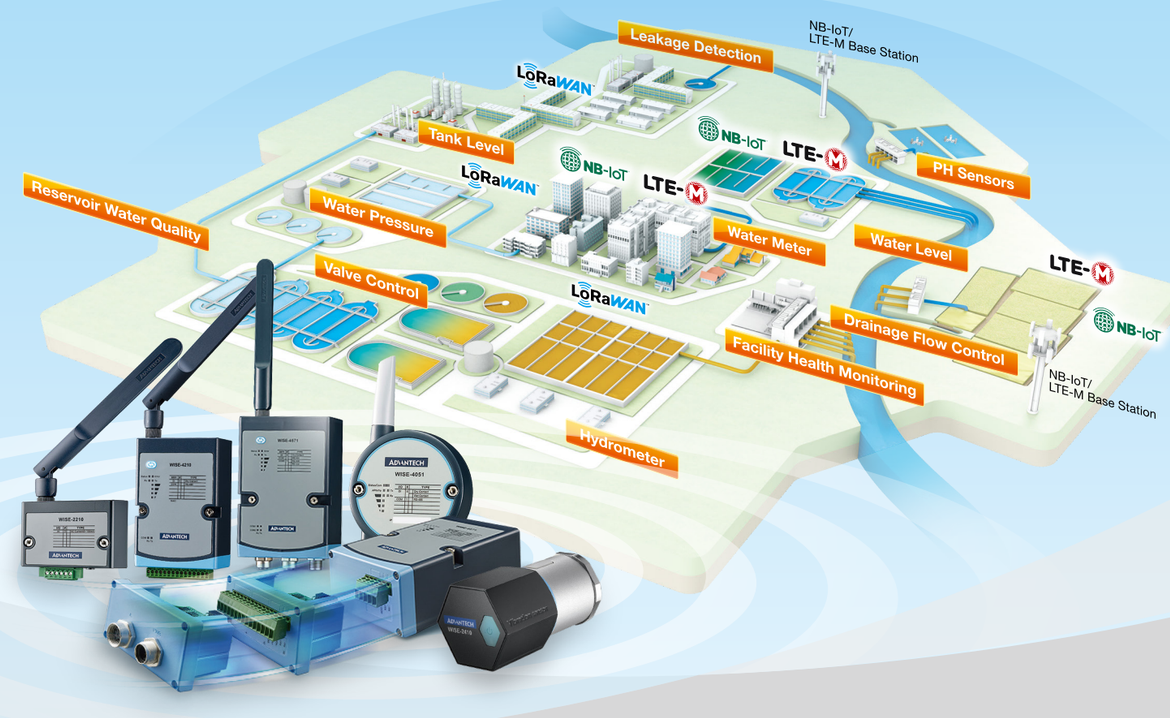


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# Mirai and Advantech Help Singapore Develop Green Energy Solutions

Mirai Electronics and Advantech are leveraging their respective strengths and expertise to produce solutions that help Singapore develop green energy capabilities.

**Photos provided by Mirai Electronics**
**Interview with William Tan, Managing Director of Mirai Electronics**

Approximately 95% of Singapore's current electricity supply is generated using natural gas, placing the city-state in an unfavorable position concerning sustainable energy. Indeed, Singapore lacks hydroelectric resources, and wind/geothermal energy sources are not economically viable. As Singapore is a tropical country, solar energy remains the most promising solution.

Mr. William Tan, Managing Director of Mirai Electronics, stated, "With an average annual solar irradiance of 1,580 kWh/m2/year, solar photovoltaic (PV) generation has the greatest potential for wider development. Singapore's Energy Market Authority (EMA) aims to deploy at least 2 gigawatt peak (GWp) of solar energy by 2030. This is equivalent to powering about 350,000 households for a year." The EMA has enhanced its market and the regulatory framework, introducing Enhanced Central Intermediary Scheme (ECIS) and the Solar Generation Profile (SGP) in an effort to streamline existing processes and facilitate the deployment of solar energy. The number of grid-connected solar PV installations has grown from 169 to 4,585 between 2011 and the first quarter of 2021.


## Wide range of solutions contribute to reduction of energy consumption and emissions

Mirai offers professional hardware and software solutions, as well as system integration and installation services for smart energy monitoring and management. They have quickly become a leading supplier of energy and solar PV monitoring solutions in Singapore and provide robust embedded and IoT gateway controllers, including those designed and manufactured by Advantech, in an effort to accommodate the EMA's strategy and energy programs. These controllers feature software solutions based on WebAccess/SCADA that help utility and energy companies gather, filter, and analyze data from the edge to the cloud. These turnkey solutions deliver insights into usage patterns while identifying areas for grid performance optimization.

As Mirai's strategic partner, Advantech offers a wide range of edge computing devices, AI solutions, wireless connectivity solutions, embedded boards, industrial peripherals, and customization services. With Advantech's support, end customers improve the real-time transparency of their energy efficiency projects, solar PV, and metered assets. This helps them prioritize and manage initiatives that reduce energy consumption and emissions.

## Complementary expertise and strengths lead to success

Mirai and Advantech have developed successful solutions and cooperation models that complement their respective strengths. Consequently, they have undertaken more than 75 solar PV monitoring projects. Last year, EMA and Keppel Offshore & Marine (Keppel O&M) jointly awarded a research grant for a pilot project involving Singapore's first floating energy storage system (ESS). This project is part of a US$10 million partnership between EMA and Keppel O&M, and sought to develop innovative energy solutions in the marine sector. It was awarded to a consortium in which Mirai is a key member.

Another notable smart energy monitoring and management project that Mirai carried out using Advantech's solutions was the provision of a real-time PV monitoring system to YTL Power Seraya Pte. Limited, a Singapore-based energy company. Mirai and Advantech delivered a comprehensive solution that monitors smaller, geographically disparate power stations while minimizing downtime and maximizing solar power output efficiency. This solution also enabled predictive maintenance.

Over the past two years, Mirai has invested in the development of a range of new products and services that empower solar PV management, energy management, and IoT. These solutions are based on Advantech's hardware and software and cater to meteorological measurements, IoT sensing, data communication, and warehousing applications.

> *"As Mirai's strategic partner, Advantech provides a wide range of edge computing devices, AI solutions, wireless connectivity solutions, embedded boards, industrial peripherals, and customization services.", said William Tan, Managing Director of Mirai Electronics*

Mirai and Advantech have a mutually beneficial partnership. Mirai provides valuable end-user feedback to Advantech's R&D team, who responds by quickly implementing changes that make products more relevant to solar PV generators — thus benefitting Mirai. The current generation of products is aimed at equipment monitoring and thus requires reliable data communications, storage, and presentation. Mr. Tan added, "We hope to implement automated defect monitoring and service improvement solutions in the short term. We are looking at functions like predictive maintenance and performance evaluation and forecasting in the midterm. Finally, we envision AI models for preventive maintenance and performance enhancements by identifying fault locations and possible areas for improvement in the long term." ■

# Advantech's InnoTalks Program Offers a Deep Dive into the Latest IIoT Trends

**Photos provided by Advantech**

As the world of technology rapidly evolves, we must continue adapting to new market trends and developments. Through mutual sharing of knowledge and experience, we can inspire each other to further accelerate technological progress.

To this end, Advantech launched its online program InnoTalks in 2021. This program brings together industry experts and professionals to discuss strategies for realizing industrial automation and IoT. Each month, the program highlights different themes and invites partners from around the world to share insights regarding the latest trends and technologies in four key sectors: smart factories, smart machinery, intelligent transportation, and energy and environment. The topics addressed focus on practical solutions for converging OT and IT from the edge to the cloud. These solutions include wireless technologies (5G, LTE, Wi-Fi, LoRaWAN), AI, edge AI, industrial IoT, and intelligent connectivity.

For valuable industry-oriented content, tune into our InnoTalks program every month. Simply register and begin receiving actionable market intelligence. You can also visit our official InnoTalks website to watch previously streamed videos and downloadable resources, such as PowerPoint presentations, case studies, and more. ■





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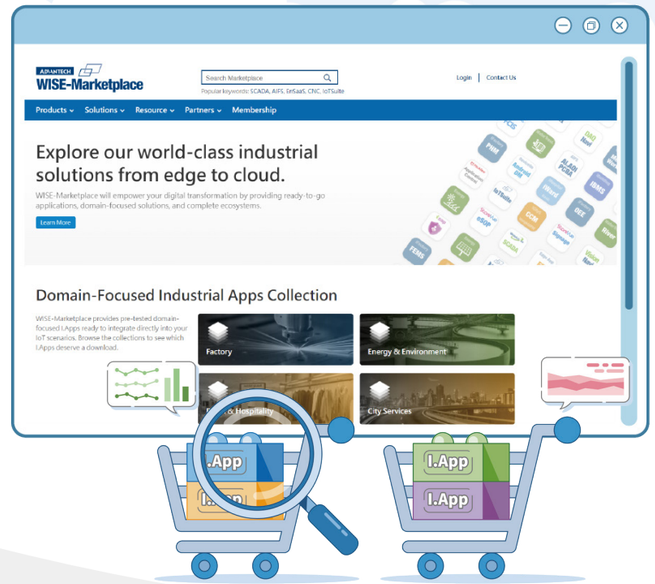


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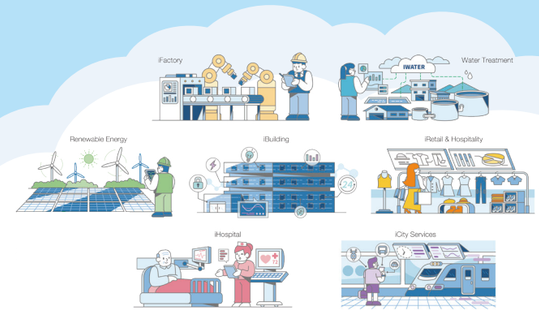
With our cohensive ecosystem, WISE-Marketplace can empower your digital transformation!

**Quickly Realize Your AIoT Digital Transformation.**

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# Enabling an Intelligent and Sustainable Planet

ADVANTECH

*Enabling an Intelligent Planet*

Advantech's hardware, software, I.Apps, and integration solutions consist of various products designed for specific applications, such as in energy (solar energy, wind energy, smart grids, electric vehicle charging stations, building energy-saving, and energy-saving monitors), flood and disaster prevention, sewage treatment, remote education, public safety (smart street lighting, transportation safety), public health, telemedicine, smart medicine, cold chain management (food safety), smart agriculture, information security, and cloud computing. In 2020, our worldwide revenue for the sale of products used for sustainable purposes accounted for 15.79% of our total revenue.

In the future, we aim to incorporate sustainability concepts into our strategy blueprint for developing new products in different industries. We will continue to develop smart solution plans to make the world cleaner, safer, healthier, and more convenient, enabling an intelligent and sustainable planet.

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