Case study

Network health and energy efficiency:

Ericsson and Far EasTone's model for sustainable network excellence

ERICSSON

In partnership with

FAR EASTONE 遠傳

No time to waste

Case study:
Far EasTone

Industry:
Telecommunications

Executive summary

Reducing energy consumption is an urgent matter for all Communications Service Providers, but is it really possible without compromising the robustness needed for networks to serve their critical societal function? In a collaboration with Taiwanese performance leader Far EasTone, Ericsson's Service Continuity AI app delivered a 25% saving on daily network power consumption with no impact on network performance KPIs. In tandem, the Node Radio Power Efficiency Analysis visualized the network's energy efficiency, providing repair recommendations to help optimize power consumption as well as shorten time to fix. The result? Better energy efficiency and better insights on network health, a win-win for the user, the CSP, and the planet.

Our world stands before a fork in the road, with a clear and present risk of breaching irreversible tipping points.

The "final warning" of the UN Intergovernmental Panel on Climate Change (IPCC) AR6 Synthesis Report 2023 could not be clearer: we must act now if there is to be any hope of avoiding irreversible damage. UN Secretary General António Guterres was unequivocal in concluding that we need to "massively fast-track climate efforts by every country and every sector on every timeframe."

Communication service providers (CSPs) are no exception. "Estimated to be responsible for around two percent of global energy demand," the need for greater energy efficiency in the sector is more pressing than ever. New technologies which consume high volumes of data and the growing need for network densification only put further urgency on the situation. Especially when connectivity serves an increasingly essential societal function, all against the backdrop of soaring energy prices that impact businesses as much as they do consumers.

Supporting critical Taiwanese infrastructure

In Taiwan – a highly connected, densely populated society which imports 98 percent of its total energy supply – this challenge is particularly acute. A hub for international trade located in one of the busiest shipping lanes in the world, connectivity is non-negotiable. But the energy which powers it is precious. And as 5G connectivity in Taiwan continues to soar in the coming years (see the accompanying graph), so too will data-heavy activity on its networks increase, making intelligent use of energy even more vital.

Leading Taiwanese CSP Far EasTone Telecom (FET) has for a number of years been exploring the use of new technologies to make its operations more energy efficient. But with its networks a key part of critical infrastructure, energy efficiency gains must always be weighed against successfully maintaining a reliable high standard of service for the end user, without compromise.

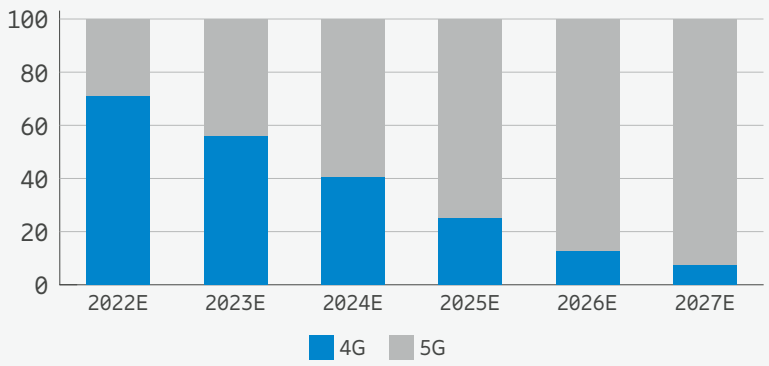
The need to ensure consistently robust network performance is made even more prescient by Taiwanese regulations which dictate that complaints about network service disruptions experienced by users are made public, encouraging maintenance of a consistent customer experience at a high standard.

"Sustainability is a top priority for Far EasTone," Chee Ching, President FET, explains. "On top of that, Radio Access Network (RAN) stations' electricity consumption account for 71 percent of our electricity bill every year, regardless of savings in other network components – that's huge. Anything Ericsson can do to improve network energy efficiency is of major value therefore."

Did you know?

Ericsson was named the overall leader in the ABI Research sustainability assessment, topping a number of categories

Taiwan: Projected Mobile Subscriptions by Technology Generation (%) 2022E – 2027E



Source: GlobalData Technology Intelligence Center

"We know that Far EasTone works hard on sustainability and it is a key part of their vision," Nello Califano, Head of Strategy Ericsson Network Services comments. "That is also the case for Ericsson, so there is a shared commitment to creating new technologies that can make a big impact in this area. At Ericsson we work broadly and extensively on energy efficiency, both from a product and services perspective, and we are certain that AI apps and network intelligence have huge potential in this area."

Balancing superior performance with energy efficiency

Traditional methods of reducing network energy consumption have often carried a significant amount of risk relative to reward. In particular when the approach involves manually adjusting the power levels to radio antennas. Adjusting nodes for energy usage must always be balanced against maintaining traffic KPIs, and the level of granularity previously available was not conducive for doing so in an effective manner. These methods are unable to dynamically respond in real time to the fluctuating demands being put on the network by user behavior.

The end result is that networks ultimately miss out on energy savings by continuing to direct the same amount of power to network components during periods when it is not needed. And even during phases of high network traffic, where powering down would not be an option, energy efficiency gains are still missed due to undetected maintenance issues such as leakage caused by hardware failures or poorly optimized components.

Put simply, better solutions are essential to ensure that the volume of energy being used by networks correlates more closely to the volume of energy user activity requires.

25%
Daily network power saving

Building on more than 20 years of successful partnership, FET believed that Ericsson's AI and Machine Learning-powered solutions could achieve that sweet spot. Their key question: could those solutions do so while maintaining the robustness demanded by a network recognized as number one in performance in its market? In other words, deliver a win-win outcome for the network, the end user, and the planet. The results of Ericsson's new Service Continuity technology collaboration show that it can be done.

Using AI to dynamically respond to network energy needs

Like Ericsson, Far EasTone is convinced that AI will play a key role in reducing energy consumption and bringing telecoms closer to Net Zero. The solutions framework deployed in the collaboration are part of Ericsson's cutting-edge Service Continuity AI app suite. These seek to solve issues in the network before they impact the network's customer, using a range of advanced algorithms and AI tools to actively look for potential adjustments.

Many of these solutions use automation to improve efficiency in operations across a number of parameters. They are complemented by the Deep Sleep functionality launched by Ericsson in 2022 allowing a new level of energy savings from radio hardware, with the power to shut down almost all digital components to facilitate ultra-low energy consumption. That translates to the potential to save around 70 percent of the energy otherwise consumed by hibernating radios when there is little or no traffic.

Getting maximum value from this functionality requires highly complex AI solutions, trained on real network data, which can accurately predict when to close down components and wake them up again without impacting performance. As a leader in 5G network performance, FET expects any AI-driven energy saving solutions deployed on its network to adhere to its high service continuity standards: the end user must not experience any notable disruption in their network experience.

Highlights from Far EasTone's 5G Journey with Ericsson

- February 2021: Ericsson and Far EasTone build dedicated network for MediaTek 5G chipset production
- March 2021: Far EasTone expands Ericsson 5G partnership, including AI-powered Cognitive Optimisation
- July 2021: Far EasTone and Ericsson launch Taiwan's first 5G Core Lab for 5G Standalone (SA)
- September 2021: Far EasTone's 5G powered by Ericsson ranked world number one by Open Signal!
- November 2021: Far EasTone and Ericsson mark breakthrough in 5G network slicing
- Feb 2022: Far EasTone and Ericsson demonstrate dynamic network slicing at MWC 2022
- March 2022: Far EasTone joins Ericsson Startup 5G program to boost application case
- Jun 2022: Far EasTone and Ericsson join hands in responsible recycling program to recycle decommissioned network equipment
- July 2022: Ericsson and Far EasTone give world's first demonstration of 5G multiple network slicing through Local Packet Gateway
- January 2023: Far EasTone and Ericsson use 5G network splicing to deliver Smart Patrol Car solution to Taiwan police
- February 2023: Far EasTone and Ericsson sign MoU for 5G, AI and beyond
- March 2023: Far EasTone and Ericsson demo 5G Smart Patrol Car and energy-saving AI apps at Mobile World Congress 2023

Ericsson Service Continuity: How it works

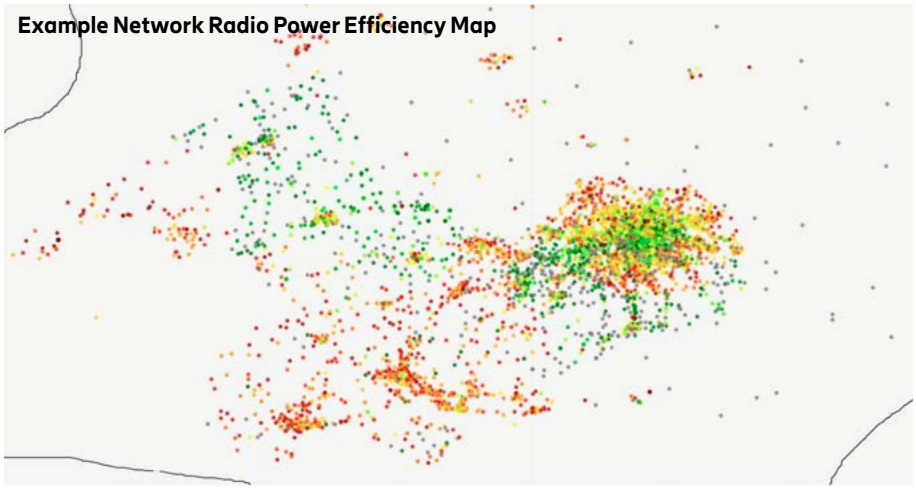
The solution deployed in the collaboration uses a machine learning prediction model which regularly assesses new network data in order to make a decision: should it close a component down, should it activate a component, or should it do nothing? That decision is based both on predictions founded in the live network data it is trained on, and also active monitoring carried out on activity in neighboring cells.

This means if activity detected from neighboring cells differs from what the machine learning prediction calculated – increased traffic detected on its way to the cell in question for example – then the prediction is overridden, and the cell woken up with the lead time necessary in order to not impact service performance. The opposite is also true: if the prediction says increased traffic is about to occur, but in reality the neighboring cell data shows it will not, an override can also take place so nothing changes and sleep mode continues to save energy.

"The strength of the algorithm is in highly accurate classification of cells and its ability to correctly determine whether energy savings measures should be applied to them, or if they should go untouched," Massimiliano Fratini, Strategic Product Manager for Energy Efficiency in Telco Networks, Ericsson explains.

"The AI is very flexible. Cells are classified as coverage or capacity cells. Coverage cells determine the aggressiveness of the algorithm by acting as 'ears' on network activity. The less coverage cells you choose to have, the higher the reliance on the machine learning, and the more capacity you have to put cells in deep sleep and make aggressive energy savings. The degree of aggressiveness in which savings are pursued is proportionate to the number of cells left as coverage cells: the customer has the freedom to decide on this according to their own needs."

In Ericsson and FET's collaboration a safety-first approach was initially adopted, set to pursue a more conservative level of energy savings. As the AI proved its ability over time, ambitiousness was gradually increased to deliver better results. At first FET only used the energy-saving solution during off-peak nighttime hours, but quickly decided it could be relied upon to apply the solution across a full day, including busier periods.



Unlocking network performance insights from energy data

Powering down network components according to traffic reduction is only one part of the collaboration's energy efficiency solutions. It is equally important to be as energy-efficient as possible even when there is consistently high traffic, and one major culprit preventing that is waste and leakage. That's where the second solution deployed in the collaboration comes in, Ericsson's Node Radio Power Efficiency Analysis service. First, the solution creates a map of all the cells in a network. It then calculates the energy efficiency of each cell according to traffic level and energy consumption, before assigning it with a value.

To ensure apples are not compared with oranges (cells in cities will consume more energy and have higher demands than cells in the countryside for example) a powerful machine learning tool clusters the cells according to their location, radio type and other relevant parameters to ensure only cells with similar conditions are clustered and ranked together.

Once clustered, the cells are then ranked according to energy efficiency and the service carries out an analysis to explain why any underperforming cells are not reaching their full energy efficiency potential.

"It could be that over-dimensioning of the cell is occurring without the CSP realizing, or hardware and software failures have occurred, all of which reduce the capacity to handle traffic and increase power usage," Frida Mattsson, Strategic Product manager for Service Continuity, Ericsson, details. "The service can also identify if power-saving features are not activated in a cell when they could be. Those are common factors, and the app is constantly flagging up potential new issues."
The map serves as a powerful time-saving assistant, delivering immediate visual feedback that enhances the ability for skilled engineers to work more efficiently, warning about faulty patterns before they become a larger problem and helping to assist in root cause analysis – the essence of effective preemption. A healthy network is also a more energy-efficient network, so the benefits are not only noteworthy in terms of energy efficiency, but also in quality of network performance. The service treats energy in networks not only as a parameter to be optimized, but also powerful input data that can be better harnessed for discovering failures.

One step closer to sustainable network excellence

"The collaboration showed that FET was able to make RAN energy savings of 25 percent with the solution running over the course of a full day at a balanced level of aggressiveness, Nello Califano explains. "Crucially, this occurred without any abnormal impact on network performance KPIs. In other words, energy efficiency was improved significantly without any noticeable impact for the network's end user."

"We have always been looking for innovative ways to improve energy usage. The solution Ericsson deployed worked very well: with a relatively conservative level of activeness the AI solution made a 25 percent energy saving – that's a lot. The result is already very impressive and

doing it at a larger scale could be even more impressive still," Chee Ching, President FET, concludes.

Data from the collaboration shows that a more aggressive approach could deliver as much as between 32 and 46 percent RAN energy savings. And as is typical with machine learning solutions, there is potential for the AI to become more effective as it gains more input data from the network and learns accordingly. Deployed at scale and running at its most aggressive capacity possible, it is estimated that the solution could save as much as 55.3743 MWh of energy per day – that's the equivalent amount of energy that 74 electric cars of the market-leading model would consume by driving coast-to-coast, all the way from New York to LA. While this level of aggressiveness is unlikely to be suitable in most scenarios, the projection shows how high the ceiling is for CSPs with the ambition of making the greatest energy savings possible.

The network energy efficiency mapping meanwhile pinpointed and provided recommendations on a number of concrete issues from the radios assessed in the collaboration , such as antennas pointing in inefficient directions, or cell overlap inefficiencies, which FET could then act upon by sending technicians to carry out assessments. Executed at scale, this could help shorten fault fix flow, and empower technicians to better anticipate the moment of fix and time to fix, helping to ensure a robust network performance for the end user.

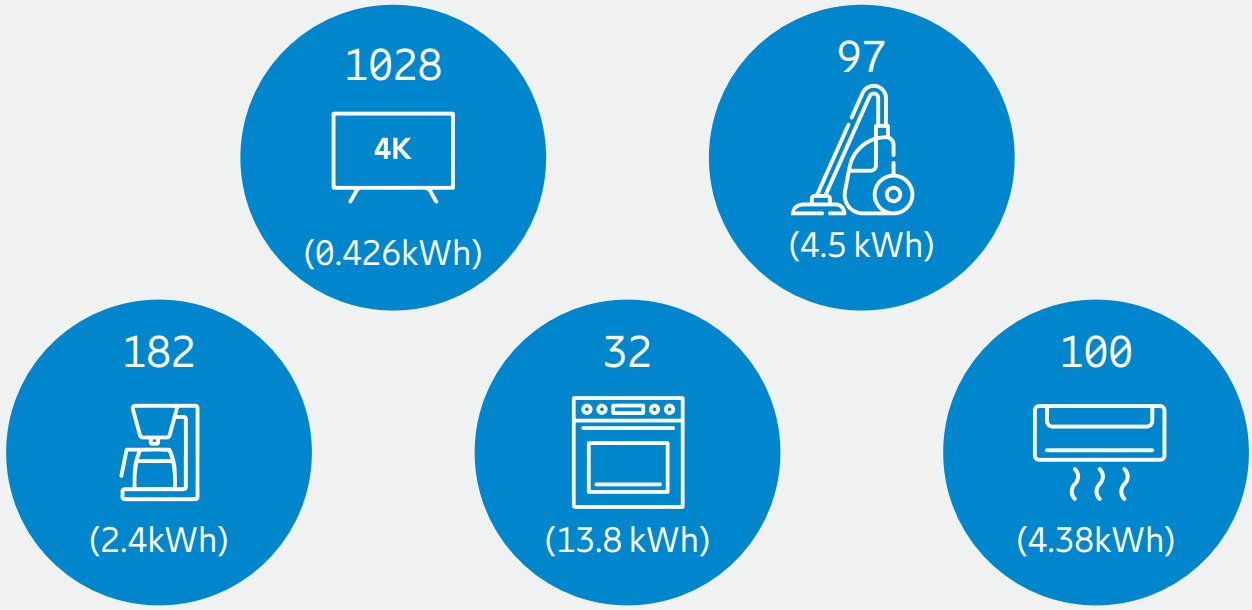
The collaboration successfully showed that the solutions can be trusted to deliver energy efficiency benefits while also helping to maintain service quality, and Ericsson and FET now plan to roll out the solutions at a larger scale, continuing in the spirit of co-creation which allowed this first step to be so successful. As the machine learning component gains more learnings from real network usage data, and the AI further proves it can be allowed a more aggressive degree of intervention, there is potential to save even more significant amounts of energy.

At the same time the Node Radio Power Efficiency Analysis can provide a powerful and faster way to determine network maintenance needs before they become a greater problem while also helping to maintain energy efficiency. These steps are not only highly valuable for FET and other CSPs in the pursuit of more consistent network performance and Net Zero goals, but they are also exactly the kind of innovations required imminently to address the climate crisis. If this kind of data-driven approach to energy efficiency is applied more broadly to treat network sites as part of an energy ecosystem feedback loop, then the possibilities are huge.

Imagine correlating daily weather forecast data from radio sites to predict whether they could run on solar or wind energy generated from installations at the site on a given day. Charging batteries on site during the day using power generated by renewables, so the radios can then run from battery energy overnight, reducing their grid contribution. Or applying data-driven learnings to specifically use battery-stored energy at times where electricity tariffs are highest, not only reducing the carbon footprint of the site, but also the operating cost as a result. Once this holistic approach to network data is regulated and applied, there is the real possibility to move to a next level of consistent high network performance, balanced with a significantly reduced impact on the planet.

Average of 437.88 kWh total energy saved*

Equivalent energy usage in the same time period of...



* Over six hour period where most aggressive strategy was applied to selected cells.

About Far EasTone

Far EasTone Telecommunications (FET) is a leading company in Taiwan which provides telecommunications and digital application services. Since its establishment in 1997, FET has strived to close the gap between people to achieve the objective of "Closing the distance". As the 5G era approaches, FET has set its sights beyond telecommunications and has reinterpreted the brand statement in 2019, setting a new milestone with " For Every Thought, We Go Further". FET's aim is, through Big Data, AI, IoT and other digital applications, to not only bring people closer together in mind, also to reduce the gap between people and new technology.

About Ericsson

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York. www.ericsson.com

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