Measure energy consumption

Phase 2 submission

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Abstract:

Energy consumption in mobile networks has increased with the roll-out of each new generation. And with the expanded spectrum of 5G and the growing site densification demands of emerging use cases, this upward trajectory is set to continue if we don’t evolve how we plan, operate and deploy our networks and infrastructure. Leveraging artificial intelligence (AI) and machine learning (ML) for automation and informed decision-making is absolutely critical to break the energy curve and help the telecom industry move towards our Net Zero goals.

How can AI help reduce energy consumption?

With advanced network design and optimization services, AI is already making a big impact on energy performance in hardware and software. When it comes to network design, the functionalities are centered on planning – using different AI models to give communication service providers (CSPs) a deeper understanding of the network and its users, enabling them to build with precision. Every network and site is unique, so it’s important for energy-efficient solutions (such as Ericsson’s 5G radio access network (RAN) portfolio) to provide a wide range of products adapted to each radio site’s needs.

CSPs want to deploy sites – and services – where the customer demand is. With AI insights, they can identify which locations 5G sites, new carrier additions or other resources should be deployed, so they can be used where they will be most efficient.

Network optimization services, however, represent the area with the biggest impact. As we described in a recent Ericsson Technology Review article on AI and ensuring energy-efficient networks, AI predictions – coupled with energy-saving functionalities – can make vital decisions based on the network’s needs. They can decide what resources will be needed in the coming hours and if all the capacity in the frequency bands within the Radio Access Network (RAN) will be needed during that time. They can then dynamically turn off or on different frequency bands or resources according to upcoming demand, saving energy when demand is low.

As discussed in the Breaking the Energy Curve report mentioned earlier, the RAN, with its active and passive equipment, accounts for over 75 percent of the overall energy consumption in mobile networks. Consequently, these types of services can have a significant impact not only on the sustainability of a CSP’s operations, but also on their bottom line.

For example, attributed 71 percent of their electricity bills to their RAN. By utilizing Ericsson’s Service Continuity AI app suite, they were able to save 25 percent on their daily RAN energy consumption, with no adverse impact on their network performance.

But many CSPs are yet to take advantage of these functionalities and begin their move toward more sustainable networks. Despite strong global pressure including energy price volatility and regulations to lower carbon emissions, many CSPs are hesitant to activate the energy-saving features they already have in their networks or RAN equipment. This may be due to perceived risks of negative impact on their network performance or customer experience, or a lack of awareness of what they stand to gain. But as it turns out, AI has a solution offering peace of mind there too.

How AI is enabling smart energy

By ensuring all sites are fully connected, smart energy management functionality can take things to a whole new level, as described in our white paper on the opportunities of ancillary services to utilities using mobile network power infrastructure.

This is where we start to look at not only the active infrastructure like the RAN equipment we discussed earlier, but also the passive equipment – particularly power system operation, which also includes other systems that consume energy, such as climate control or air conditioning. While the main purpose of power systems is to provide power conversion from AC to DC and backup for the active equipment, if they are digitized and remotely connected and controlled, we can also use and manage the energy infrastructure and operations more intelligently.

For example, many countries already have electricity tariffs that vary on a seasonal basis, or during peak demand hours – and with high energy costs, carbon emission regulations and the increasing use of, and demand for, renewable energy (which often provides a fluctuating supply at different times, depending on the source), it’s likely this will become a standard we see across the globe.

With a connected site, energy systems can be managed and orchestrated to prioritize or engage particular power sources or actions, reducing operational expenses. For example, AI-powered applications can tell the power systems to switch to using the batteries during times when tariffs are higher (peak load shifting), or when the grid power usage reaches a certain power grid alternating current limit (AC limit).

These features become even more interesting from a sustainability standpoint, when we factor in hybrid functionality – when the site owner invests in having renewable energy added to the site itself. At this point, Ericsson AI technology and data such as weather forecasts and the aforementioned tariffs and energy grid information can all be brought together to optimize energy efficiency – and lower costs even further.

They can decide when the site should run on the grid, solar power or wind power, and when to charge or discharge the battery from variable power sources – ensuring everything is ready to meet predicted demand and conditions ahead of time. Early analysis based on test data carried out at our Global Artificial Intelligence Accelerators (GAIA) shows a potential savings of SEK 15 thousand (almost USD 1,400) per site per year on cooling energy by optimizing the power sources based on the real-time state.

Conclusion

As we look toward the future and evolving technologies, one thing remains central to our society – our critical infrastructure. Power grids, water supplies and telecommunications networks are absolutely key for sustainable development – even reflected in Goal 9 of the United Nations Sustainable Development Goals, to “build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.” But this critical infrastructure is in danger from ever more sophisticated threats. As the security of our networks becomes more and more complex, AI will be pivotal in facing the challenges to come.

Finally, as climate action and carbon regulation continue to develop, we will see increasing demands for transparency and accountability when it comes to our energy sources. Some CSPs are already shifting to 100 percent renewable energy – making this a selling point in their communication, while publicly calling on other operators to do the same.

We’re already having dialogues with grid utility companies about more open data availability from the grid network on the percentage of renewables or carbon footprint of the energy used, and as demands for more granular information like this grow from industry and the public, AI will have yet another role to play in monitoring and analyzing those sources.

Ultimately, this area may be evolving rapidly – but it’s one where nobody can afford to be left behind.