ESA Blog Post: Storage is Software

How is your company providing/supporting the development of software to meet the goal of 100GW by 2030?

Flexibility solutions like energy storage and energy management systems that connect energy assets to energy markets in both technically and economically optimized manners, are fundamental for the energy transition. Why? They provide flexibility and reliability to electricity grids. This combo of energy storage and smart software will play a key role not only in meeting decarbonization targets in the U.S., but also worldwide.

As a leading energy optimizer, Wärtsilä provides complete energy storage solutions comprising hardware, software, and lifecycle services. With an in-house team of software and data analytics experts, and over a decade of experience in mature energy management software controls, we are constantly working on developing our GEMS Digital Energy Platform. The GEMS software integrates and controls individual resources and entire fleets comprising energy storage, renewables, and traditional thermal generation.

Using machine learning and historic and real-time data analytics to optimize the asset mix, GEMS enables customers to remotely monitor, operate, identify, and diagnose equipment with unrivalled safety, reliability, and flexibility. GEMS also optimizes the operational value and energy performance for the system's lifecycle. The portfolio is specifically designed to adapt to changes in market conditions and rate structures, effectively future-proofing energy storage investments for both energy providers and regulated utilities. It not only opens the possibility for new revenue streams, but also provides the possibility to integrate additional energy assets.

How has software's role in energy storage changed in the last five years?

Smart software is rapidly becoming recognized as key to the bankability and value proposition of energy storage, which plays a crucial role on the path to decarbonization. Software acts as a modern-day map, helping to navigate and chart today's energy grids. Artificial intelligence (AI) and machine learning (ML) are becoming synonymous with the operation of power generation facilities.

The increased digitization of power plants, from equipment to software, involves both thermal generation and renewable energy installations. Software engineers are tasked with carefully delineating how each region's energy markets operate. Wärtsilä uses AI, along with advanced diagnostics, and its deep equipment expertise to enhance the safety, efficiency, and reliability of both power systems and equipment.

A battery is still arguably an expensive asset, but it for sure can serve critical functions simultaneously. It can do numerous things at once, and in both directions – charging and discharging. To put it simply, it's a handy balancing tool for any grid. However, without software such as Wärtsilä's GEMS Digital Energy Platform to act as a central computing hub for not only batteries but any power generation assets, several of the fundamental problems of renewables would remain unsolved. Our electricity grids combined with their associated controls and markets are perhaps some of the most complex machines that humans have built.

What advancements are needed in software capabilities/functionality to reach the 100GW goal?

In small island areas, smart controls are critical. In the larger grids, software is an evolving and developing piece of the equation. The initial moves on flexibility have not needed quite the same level of intelligence yet. However, as we move into even higher levels of

penetration, the intelligence is going to become necessary.

The benefit of machine learning for the power generation industry is higher utilization of the existing infrastructure, and there is a lot of under-utilized infrastructure within the industry. Better utilizing the infrastructure can be accomplished with greater intelligence on the edges of the network, meaning out at each substation and at each independent generation facility, coupled with greater intelligence at the points of central dispatch.

The short-term future is simply an extension of what we are seeing today. As more renewables come onto the grids, we will see additional negative price events and price volatility. As time goes on, we can expect that the existing market structures will cease to be the most efficient for society. If there is a storage system tied to renewable generation, there is renewable power available to meet the energy market demands. However, this requires that the system is connected to an auto-bidding software that can determine market demand timing and pricing and release the energy as it is selected.

Because of the nature of flexible systems, bidding from storage requires a sophisticated approach that anticipates fluctuations and can react and recalibrate in fractions of a second. Even if this becomes very complex, it is something that an algorithmic software instead easily can manage. In fact, auto-bidding software makes it possible for energy storage systems to see across multiple energy markets and dispatch to them simultaneously, giving asset owners access to multiple revenue streams. Systems can meet their contractual agreements of frequency regulation and then sell the remaining unused energy on the wholesale market. Smart energy management software can price competitively and ensure that it is always bidding renewable power at the lowest rates so that their dispatch is prioritized and chosen over fossil fuels. This is exactly what our GEMS IntelliBidder product does, adding automated market bidding capabilities and enabling stacking of multiple applications – and therefore multiple revenues – for energy asset operators.

So, software brings into the equation market access and trading capability, but also provides a flexible power plant more levers with which to play. Optimization of energy assets extends beyond market trading to include operating and managing them to maximise economic return and a constant energy supply. With more customized software that understands market dynamics and leverages assets to their full extent, more active participation and bidding by distributed energy resources will become the new standard.

Advanced software is the driver to optimize the value of your energy storage systems and energy assets, making the right decisions to efficiently move towards an energy future powered by renewables. To facilitate a faster transition to 100% renewables, we need to systematically popularize storage backed by software that controls and integrates energy storage, renewables and traditional thermal generation assets using machine learning and historic and real-time data analytics to calibrate what type of generation is needed at a specific time. This ensures that the energy performance is always optimized. The future of energy is like a well-orchestrated symphony – a cacophony of energy resources, synchronized and playing together harmoniously at the direction of a virtual conductor.

Wärtsilä Energy Storage & Optimization

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