The world’s most extreme battery

When it comes to motorsport, there’s no doubt that the name Williams is held in the highest esteem. The legendary organisation has been one of the sport’s leading engineering and racing protagonists with nine F1 constructors’ championships (second only to Ferrari) to its name. Its sister company, Williams Advanced Engineering (WAE) is now considered to be a major force in the electric motorsport arena thanks to its work with Formula E and more recently, as the sole power train developer for the pioneering off road championship Extreme E.

We caught up with Craig Wilson, Williams Advanced Engineering CEO and Glen Pascoe, WAE Principal Engineer, for an early Season review and an in depth look at the WAE facility. We also wanted to pick their brains about how on earth the Extreme E battery is actually made, and the challenges of creating a battery that can power the enormous ODYSSEY 21 in the most extreme locations.

**XE: First of all, how did the Williams and Extreme E relationship begin?**

Craig Wilson, “WAE had already been involved with Formula E as we were the original and only battery supplier to the championship when it began in 2014. The technology was relatively young then and were all learning a great deal – but it was hugely exciting to be part of the electric revolution and to be there from the start and we still are.

“Following the on-track successes we’ve had at Le Mans (providing engineering support for Porsche’s sports car racing programme), through the hybrid F1 era, then four seasons supplying batteries to the first-generation Formula E grid (and due to supply the Gen 3 batteries), together with being technical partner for Jaguar Racing, we have learned a lot about how to extract the highest levels of performance from a battery.

“Having proven our capabilities with Alejandro Agag, SPARK and the team in Formula E, we were then in a good position to pitch for the Extreme E sole developer role in 2019.”

**XE: What steps did Williams take to create the battery?**

Glen Pascoe,“In Extreme E, the challenge is arguably even greater than for other series as we are taking battery technology away from the traditional race circuit and into hostile environments, where humidity, dust, extremes of temperature, shock and vibration will play a huge part and to that end, the batteries have had to be uniquely tailored for the environment.

“And with races being head-to-head over short distances, the batteries are sized to manage high intensity operation over a shorter time than in other e-racing series, but in a far harsher environment. As a result, we have developed a whole new module that can produce 400kW peak power in a bespoke battery construction along with an entirely new pre-race conditioning system to maximise robustness and minimise mass.

“Simplicity, serviceability and modularity were all critical design requirements. Commercially available cells were selected and designed into a pack in conjunction with the series to align both with the race format and the vehicle performance duty cycle. Working with limited space in the car,we had to meet tough power and mass performance targets and deliver a bespoke battery pack design in under 12 months!”

**XE: How has the battery performed in the first two X Prix’s of Extreme E’s debut season, Saudi Arabia and Senegal, and what were the challenges that you faced?**

Glen Pascoe, **“**The biggest challenges in Saudi Arabia were definitely sand and the temperature! Thin air was also an issue.

“The first run simulation took part at the hottest time of the day and a battery rebuild we carried out was intensive and not helped by strong winds and even a sandstorm providing an unwelcome interruption, which covered all battery parts and electronics with a fine grit. We broke out the vacuum to begin a deep clean for all components. Eventually, the batteries were ready, and it was time for the team-wide shakedown on Friday 2 April.

“The first qualification session saw two major impacts - Stephane Sarrazin in the Veloce Racing car and Claudia Hürtgen in the ABT Cupra XE – and after the driver’s safety was checked, we were delighted to see that both batteries remained absolutely intact, safe and damage-free, showing the green light all the way through the car recovery process.

“The Senegal event brought a mixture of similarities and differences to Saudi in the challenges wefaced at the track. Whilst not as hot as Saudi Arabia, ambient temperatures remained high and was accompanied by 90%+ humidity levels. This brought its own unique challenges in ensuring we were actively managing the battery temperature both during the on-track action and between races.

“Alongside this the Senegal event showed the cars tackling a very demanding, technical and aggressive track. The batteries were constantly punished with heavy impacts and harsh vibrations as the cars bounced around the dunes and deep ruts. Ensuring battery health throughout the weekend was key to ensuring a successful event.

“Both of the first two races offered humidity, dust, extremes of temperature, shock and vibration!”

Glen concludes, “To break it down, we came away with the knowledge that…

* the batteries performed flawlessly even with the severe impacts that happened in the Desert X Prix as well as the intense head to head battles we saw in the Ocean X Prix. Working on the batteries on location went really well, which is a reflection of all the design work and that went into them
* Servicing and maintaining the batteries throughout the events went well, which is a reflection of all the design work that went into them
* Again, the batteries performed well in Senegal, a 6km long harsh, technical course, through woods and on the beach
* 480KM mileage was recorded in Senegal and 1070 km across the 2 races
* 1120KWh energy discharged in Senegal and nearly 2000kWh across both events
* Over 12 hours of on-track running”

**Have you made any improvements since then?**

Glen Pascoe, “Refinement of BMS models to extract maximum performance. And we have optimised the rate at which we log and collect data during an event to ensure most efficient learning.”

**What are you expecting when you go to the next X Prix in Greenland in August?**

Glen Pascoe “No more sand!! But yes, we’ll have to adapt and optimise to the vastly different climate and track conditions. The very new challenges of snow and of course water and mud. There will be stone impact and less grip resulting in more drift and vertical impact.

“In addition to the physical challenges, the remoteness of the location means we need to forward plan for every eventuality before arriving on location as there will be no opportunity for late deliveries or freight, no additional transport available or indeed, supplies!”

**How do you see the battery developing further as Season 1 progresses?**

Glen Pascoe, “Unlocking further vehicle performance as we gather more data on the battery and the overall powertrain.”

**What are the options for the battery at the end of Season 1?**

Glen Pascoe, “Batteries have been designed for multi-season use, so WAE will inspect, re-test and go again. Any incremental improvements available will be implemented during the turn-around. Once batteries reach the end of their final racing season, the cells can be easily removed as module ‘building blocks’ and configured into a suitable second life application. Some components are targeted for reuse in alternative applications, and some will be recycled in order to recover valuable raw materials.”

**How important are collaborations like this for race to road transfer?**

Craig Wilson, “They are a key part of transferring technology to road cars, specifically in areas such as fast charging, battery management and software development. Essentially, affordability comes with volume production. By pioneering and showcasing EV technology in a series such as Extreme E, manufacturers will be able to “carry over” technology into road cars and in doing so, enable the technology to become more affordable.”

**How is Williams’ technology implemented in cars we see on the road today?**

Craig Wilson, “As mentioned previously the key technology areas will likely be improved energy density, lifecycle, durability, power capability and fast charging. In addition, there will probably be a greater than ever emphasis on software in order to unlock more of the potential of the battery chemistry using advanced algorithms for increased performance, safety and reliability.”

**Apart from all that, are you looking forward to racing Greenland? What are you most excited about?**

Glen Pascoe, “Snowball fights in August of course!!

“No seriously, this is huge as no previous international motorsport events have ever been held in Greenland, so the WAE team are proud to be supporting this unique and ground-breaking event. Seeing the cars go head-to-head in a challenging new climate for the drivers will also be so exciting to watch. We can’t wait!”

**ENDS**

**To learn more about Extreme E, visit -** [**www.Extreme-E.com**](http://www.extreme-e.com)

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**NOTES TO EDITORS**

**About Extreme E:**

Extreme E is a radical new racing series, which will see electric SUVs competing in extreme environments around the world which have already been damaged or affected by climate and environmental issues. The five-race global voyage highlights the impact of climate change and human interference in some of the world’s most remote locations and promotes the adoption of electric vehicles in the quest for a lower carbon future for the planet.

To minimise local impact, Extreme E races will not be open to spectators, with fans instead invited to follow the action through live TV broadcast, and on social media.

The St. Helena, a former passenger cargo ship, has undergone a multi-million Euro refit to minimise emissions and transform her into Extreme E’s operations hub. The ship will be used to transport the championship’s freight and infrastructure, including vehicles, to the nearest port, minimising Extreme E’s footprint, as well as being used to facilitate scientific research through its on-board laboratory.  
  
Extreme E is also pioneering hydrogen fuel cell technology which will enable its race fleet to be charged using zero emission energy. This innovative solution from AFC Energy uses water and sun to generate hydrogen power. Not only will this process emit no greenhouse emissions, its only by-product will be water, which will be utilised elsewhere on-site.

Season 1 Calendar:

Desert X Prix: AlUla, Saudi Arabia  
3-4 April 2021  
Ocean X Prix: Lac Rose, Senegal   
29-30 May 2021  
Arctic X Prix: Kangerlussuaq, Greenland   
28-29 August 2021

X Prix Location 4   
TBC  
X Prix Location 5     
TBC

**About Continental Tires: Founding Partner and Official Tire Partner**

Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent, and affordable solutions for vehicles, machines, traffic and transportation. Continental generated preliminary sales of €37.7 billion in 2020 and currently employs more than 235,000 people in 58 countries and markets. In 2021, the company celebrates its 150th anniversary.

The Tires business area has 24 production and development locations worldwide. Continental is one of the leading tire manufacturers with more than 56,000 employees and posted preliminary sales of €10.2 billion in 2020 in this business area. Continental ranks among the technology leaders in tire production and offers a broad product range for passenger cars, commercial and special-purpose vehicles as well as two-wheelers. Through continuous investment in research and development, Continental makes a major contribution to safe, cost effective and ecologically efficient mobility. The portfolio of the Tires business area includes services for the tire trade and fleet applications, as well as digital management systems for tires.

**About CBMM: Founding Supplier**  
CBMM is the world leading supplier of niobium products and technology. Headquartered in Brazil, with offices and subsidiaries in China, Netherlands, Singapore, Switzerland and the United States. CBMM offers technical innovation to customers around the globe through a team of over 2,000 highly trained, dedicated professionals providing cutting-edge niobium products and technology to over 400 clients in around 40 countries.

**About LuisaViaRoma:**  
Defined by the Financial Times as “A haven for directional fashion,” [LUISAVIAROMA.COM](https://gbr01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furl6.mailanyone.net%2Fv1%2F%3Fm%3D1l40NA-00039a-3X%26i%3D57e1b682%26c%3D195AVmsnACejGQbj8XWTN7evBrvKJ1dnbRSlGauikIN1jvOJqayL11c08sfz5q1cceT_kfGhbO_Pgdul_vKgCHKD7IRSCNz5N1nGW9IZudTMsArXH_4RgkZJ_1yUJ1LCnfuAdJA1-KMInD6ZezFTWMgr389RpxOBDTwby2-m0iGBYpmPZjv9wwqhM1MxBH243uOw61cdEjXAR5FWvZyEV-xrW9U-ZTO-2PYSpSwfH4s&data=04%7C01%7CCarla.Corbet%40mpacreative.com%7C0caf6dd47e0f4a1eab8908d8c127765b%7C3891b9e18f6b4fe3a38ee5305dc2823a%7C1%7C0%7C637471722513203463%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=jOWRp6eyKk%2BAXQzlhUUINtGvz6Jil8elRhPIOfB8uOY%3D&reserved=0) is the top online luxury fashion destination with 5,000,000 visitors per month and worldwide shipping. With each new season, the website presents the collections of more than 600 established designers and young emerging talents.

**About Zenith: Official Timekeeper and Founding Partner**

Zenith exists to inspire individuals to pursue their dreams and make them come true – against all odds. Since its establishment in 1865, Zenith became the first watch manufacture in the modern sense of the term, and its watches have accompanied extraordinary figures that dreamt big and strived to achieve the impossible – from Louis Blériot’s history-making flight across the English Channel to Felix Baumgartner’s record-setting stratospheric free-fall jump. Zenith is also highlighting visionary and trailblazing women – past and present – by celebrating their accomplishments and creating in 2020 its first-ever collection dedicated entirely to them, Defy Midnight.

With innovation as its guiding star, Zenith features exceptional in-house developed and manufactured movements in all its watches. Since the creation of the El Primero in 1969, the world’s first automatic chronograph calibre, Zenith has gone on to master fractions of the second with the Chronomaster Sport and its 1/10th of a second precision and the DEFY 21 with a precision of 1/100th of a second. Zenith has been shaping the future of Swiss watchmaking since 1865, accompanying those who dare to challenge themselves and break barriers. The time to reach your star is now.

**About Allianz: Founding Partner and Official Insurance Partner**

The Allianz Group is one of the world's leading insurers and asset managers with more than 100 million private and corporate customers in more than 70 countries. Allianz customers benefit from a broad range of personal and corporate insurance services, ranging from property, life and health insurance to assistance services to credit insurance and global business insurance. Allianz is one of the world’s largest investors, managing around 790 billion euros on behalf of its insurance customers. Furthermore, our asset managers PIMCO and Allianz Global Investors manage 1.7 trillion euros of third-party assets. Thanks to our systematic integration of ecological and social criteria in our business processes and investment decisions, we are amongst the leaders in the insurance industry in the Dow Jones Sustainability Index. In 2020, over 150,000 employees achieved total revenues of 140 billion euros and an operating profit of 10.8 billion euros for the group.

**About Neat Burger: Official Plant-based Partner**   
Neat Burger is the first of its kind – the planet-friendly, plant-based, full-flavoured game-changer the world has been waiting for. The world’s first plant-based sustainable burger chain, Neat Burger offers a menu that appeals to not only those who follow plant-based diets, but anyone, meat-eaters included, who wants to eat delicious meat-free dishes that are more sustainable, healthier and ethical. The brand is backed by seven-time FIA Formula One World Champion Lewis Hamilton, in collaboration with hospitality organisation The Cream Group and investors, as well as UNICEF Ambassador and early backer of Beyond Meat Tommaso Chiabra.

Neat Burger opened its first site in September 2019, just off Regent Street in London, and its second and third dine-in outlets at Camden Market and Soho in 2020. Plans for global expansion across Europe, the US and Middle East are already in place for 2021 and beyond.

**About EY: Official Innovation Partner**

EY is a global leader in assurance, tax, strategy, transaction and consulting services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

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**About Enel X**

Enel X is Enel Group’s global business line offering services that accelerate innovation and drive the energy transition. A global leader in the advanced energy solution sector, Enel X manages services such as demand response for around 6 GW of total capacity at global level and around 100 MW of storage capacity installed worldwide, as well as 195,000 electric vehicle charging points made available around the globe.

Through its advanced solutions, including energy management, financial services and electric mobility, Enel X provides each partner with an intuitive, personalized ecosystem of tech platforms and consulting services, focusing on sustainability and circular economy principles in order to provide people, communities, institutions and companies with an alternative model that respects the environment and integrates technological innovation into daily life. Each solution has the power to turn decarbonization, electrification and digitalization goals into sustainable actions for everyone, in order to build a more sustainable and efficient world together.

Find out more on <https://corporate.enelx.com/en> and follow Enel X on its social media channels:

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**About XITE ENERGY: Official Energy Drink Supplier**   
XITE ENERGY was founded by Oliver Bennett and Megan Jones straight out of university two years ago. XITE brings disruptive innovation within the beverage industry; a new frontier to energy drinks. Designed around functionality but with no limitations on health, XITE ENERGY uses functional ingredients that are fused together to provide a cognitive boost, combining natural flavours, natural caffeine and zero sugar.

