# Charting a new course for offshore wind

Nikhar Parikh, TGS' head of GIS for 4C Offshore products, provides a detailed look into how advanced mapping and spatial technologies are transforming the offshore wind energy sector. These technological innovations are vital in enhancing both efficiency and sustainability, preparing the industry to address future challenges with greater efficacy.

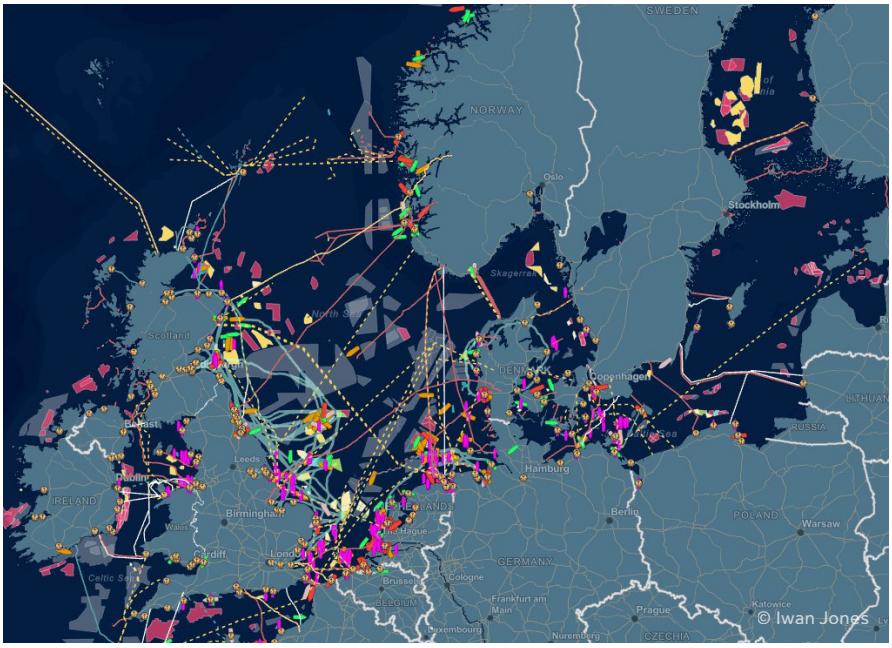
**PES: Welcome to PES Wind, Nikhar. I appreciate you taking the time to speak with us today. TGS is widely recognized for its expertise in geospatial intelligence services. Could you share more about your approach to spatial solutions and how they help businesses make more informed, data-driven decisions?**

**Nikhar Parikh:** In offshore wind energy and beyond, decision making is often hindered by fragmented data sources, unpredictable environmental conditions, and logistical challenges. By integrating seabed data, vessel routing, weather analytics, and turbine performance metrics into a single framework, location-based insights enable businesses to minimize risks and improve operational efficiency.

And yes, you are correct in saying that TGS provides these insights in a structured, accessible manner, which helps stakeholders make informed choices that drive project success.

**PES: The integration of real-time data through web-based applications has significantly changed the way spatial analysis tools function. What innovations have been introduced to enhance interactivity and user experience?**

**NP:** That's right; real-time data has transformed how spatial platforms operate, making information more dynamic and accessible. One major challenge is ensuring that this influx of data remains actionable rather than overwhelming.




Fast vessel routes from ports to wind farms currently under construction in Europe

At 4C Offshore, enhanced tools such as the Turbine Tracker and Weather Flow offer sophisticated real-time monitoring capabilities. These tools provide dynamic visual representations that detail the status of turbines, track vessel movements, and monitor evolving weather conditions. Essential features include an automated Daily Progress Report (DPR) visualization and interactive 3D models, which streamline the interpretation of complex geospatial data, allowing users to quickly access accurate information with ease and precision. This integration of advanced technology facilitates more efficient decision-making and operational effectiveness in offshore projects.

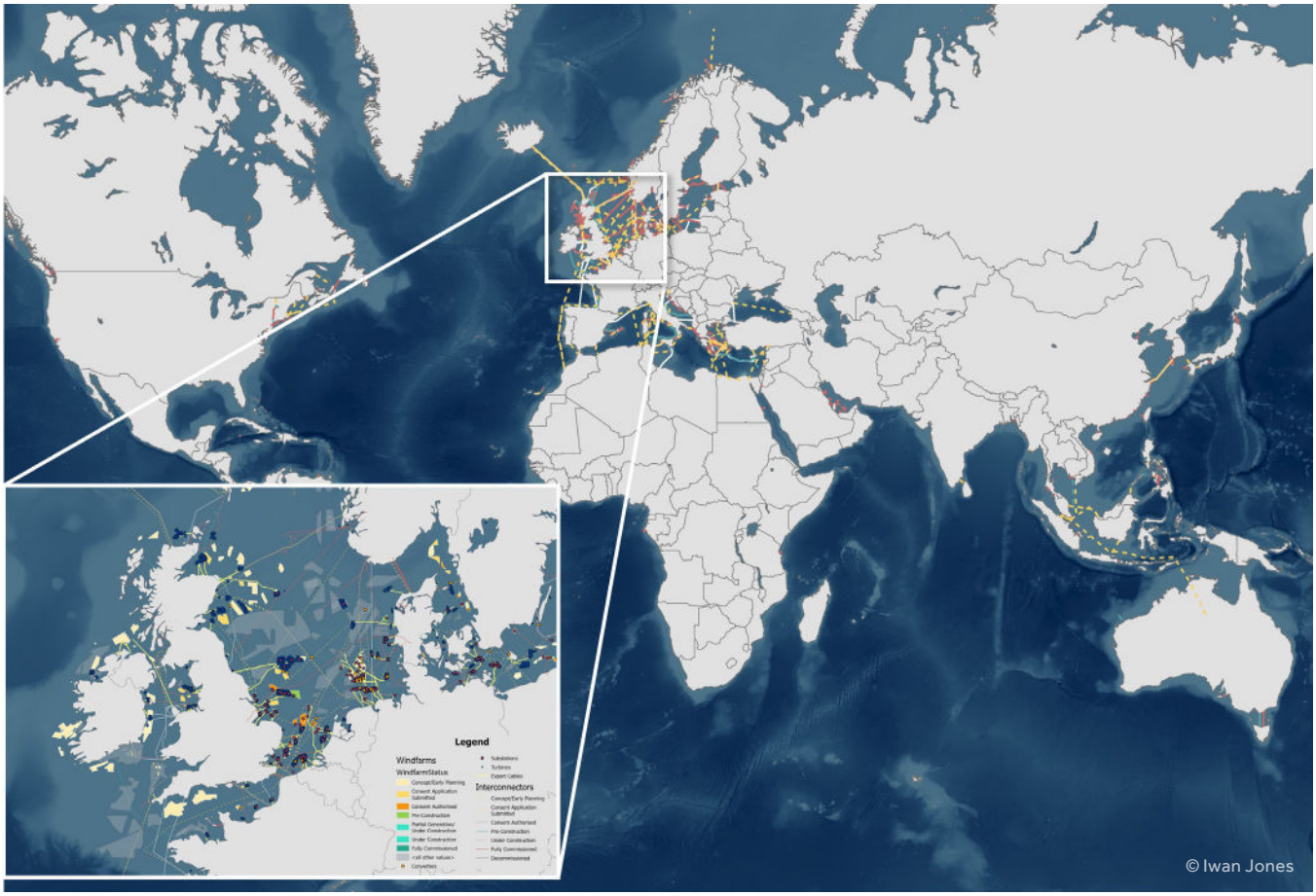
**PES: Adopting digital mapping solutions can seem daunting for businesses unfamiliar with the technology though. How do you support clients in integrating these tools smoothly into their workflows?**

**NP:** Many organizations struggle with managing vast amounts of spatial data while maintaining operational continuity. A seamless transition is essential to avoid disruption. By offering structured data management, real-time access, and automated reporting, businesses can integrate geospatial solutions into their workflows with minimal effort.

In projects like the Xlinks interconnector, TGS ensures that real-time data is continuously refreshed, while Web Feature Services and Web Map Services provide smooth integration into existing mapping platforms.

**PES: Secure and structured data management is fundamental to any spatial intelligence project, so what steps are taken to ensure efficiency in storage and retrieval?**

**NP:** Handling large datasets efficiently is a challenge across industries, especially in offshore energy where environmental, weather, and operational data must be readily available.




Global GIS boundaries and wind farm infrastructure

TGS employs a file geodatabase system that ensures secure storage and rapid retrieval of spatial information. This system supports critical projects like the Xlinks interconnector, ensuring that key data remains accessible for real-time decision making.

**PES: When geospatial data is visualized in real-time, the insights can be transformative. It would be helpful to hear of an instance where this has had a major impact.**

NP: Access to real-time mapping insights can dramatically enhance operational planning and risk mitigation. A prime example is the world's largest interconnector cable project, Xlinks, where real-time monitoring has streamlined installation planning and execution.

Additionally, the Turbine Tracker infographic provides a visual representation of project status, offering stakeholders a clear and comprehensive view of ongoing developments, something that would otherwise require extensive manual reporting.

**PES: When it comes to designing custom interactive maps, it seems there's a delicate balance between ensuring precision and creating a user-friendly experience. Are there primary principles that guide your approach to this process?**

NP: Absolutely. At the heart of effective mapping design is the ability to seamlessly combine technical accuracy with intuitive user experience. The goal is to make the complex accessible. We focus on keeping navigation clear, ensuring that users can easily interpret data, even when it involves intricate spatial intelligence.

For example, the integration of seabed layer data and historical wind farm boundaries doesn't just add depth to the map, it does so in a way that feels natural, ensuring that even the most sophisticated data is understandable for the user.

**PES: The role of accuracy becomes even more crucial when working with legacy data, doesn't it? Legacy topographic plans and older mapping materials can sometimes be less than precise.**

NP: Yes, you're right. Working with legacy data presents its own set of challenges, especially when these materials were often created without the technological capabilities we have today.

To mitigate issues, we rely heavily on advanced spatial modeling, using tools that refine and correct the older data. Techniques like bathymetric mapping are especially important. They enable us to ensure that water depth measurements are not only precise but actionable, especially when planning for offshore cable routing or turbine installation.

**PES: Satellite imagery certainly holds a wealth of information, but turning that raw data into something actionable can be a challenge. What's your approach to making satellite data meaningful and actionable?**

NP: It's an exciting area but also one that demands specialized techniques. While satellite imagery provides a tremendous amount of detail, it's not always easy to pull out useful insights without proper processing.

By integrating satellite-derived weather analytics into spatial platforms, we can identify key operational windows, such as optimal weather conditions for offshore installations. Real-time mapping overlays further enhance this, allowing offshore teams to monitor turbine positions and adjust plans on the fly, which greatly aids in project management and risk mitigation.

**PES: Dealing with marine spatial data, especially when it comes to techniques like bathymetric mapping and sub-bottom profiling, comes with its own set of challenges doesn't it?**

NP: Absolutely, this data is inherently more complex due to the constantly shifting and challenging environment of the seabed. For bathymetric mapping, we focus on high-resolution terrain modeling through integration and profiling techniques, ensuring the seabed conditions are properly assessed for turbine and cable placement.

Sub-bottom profiling also plays a crucial role by providing insights into the layers beneath the surface, helping us gauge potential construction or environmental risks. These combined methods give the team a clearer picture, reducing the uncertainty involved in offshore projects.

**PES: Lidar data is incredibly valuable, especially for terrain analysis and 3D modeling, so what processes do you use to refine and ensure the quality of this data?**

NP: Lidar is an invaluable tool, but to really maximize its potential, it requires thorough refinement. Initially, the emphasis is on filtering the raw data to remove any noise and ensure accuracy. Then, the data is classified to highlight relevant features, such as elevation, and integrate it with other datasets.

This integration is critical for offshore projects where even small inaccuracies can lead to costly errors, particularly in cable routing. Refined lidar models provide a clearer understanding of the terrain, which helps make infrastructure projects safer and more efficient.

**PES: Digital Elevation Models (DEMs) provide a detailed view of both natural and built environments. It would be helpful to learn more about your approach to using DEMs for planning.**

NP: DEMs are essential for detailed topographic assessments, and any errors in elevation modeling can lead to significant project risks, especially in offshore planning. What sets TGS apart is our approach to integrating DEMs with other spatial intelligence tools to enhance accuracy.

For example, our Elevation Tool is designed to minimize risks by providing precise elevation inputs, ensuring that cable routes and turbine placements are optimized for both safety and operational efficiency. This level of detail is crucial when dealing with complex offshore environments.

**PES: The evolution from 2D to 3D mapping seems to be reshaping spatial intelligence in many industries. Where do you see this transition heading?**

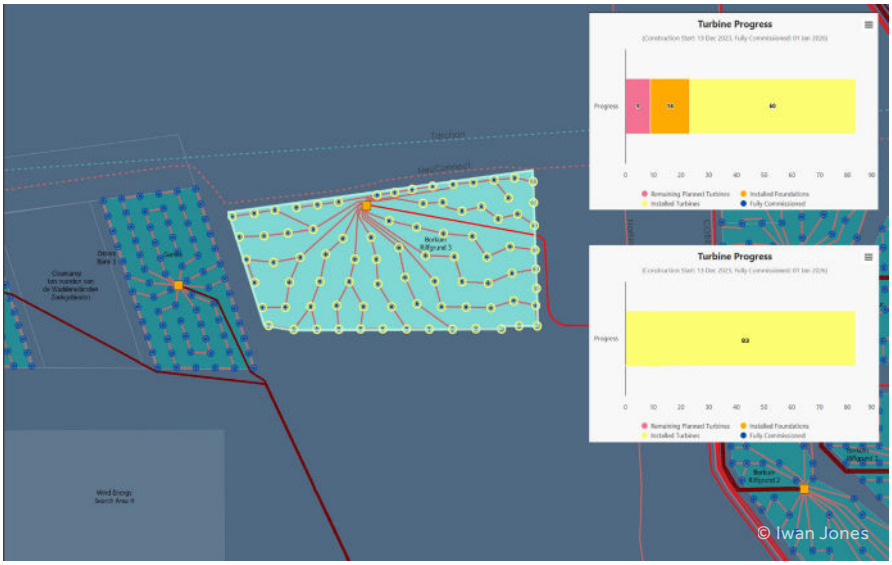
NP: The shift to 3D mapping is revolutionizing how spatial data is interpreted. By adding depth and interactivity to maps, it's easier for investors to visualize complex site conditions in a way that 2D mapping simply couldn't convey.

As we move forward, the integration of digital twins and predictive analytics will further enhance this capability, offering even greater insights into real-world applications. For example, TGS is already working to incorporate more advanced 3D features, which will not only improve the planning of offshore wind farms but also enhance their long-term operational efficiency.

**PES: It's clear that spatial solutions need to cater to specific industry needs. Can you share any standout projects where TGS' flexibility shines through?**

NP: Every industry has unique challenges that require tailored spatial solutions. One of the standout projects we've worked on in offshore wind is the Global Market Overview tool, which gives backers a deep dive into country-specific adoption rates and allows them to forecast market trends.

This project exemplifies how we're able to blend spatial intelligence with strategic planning to help businesses make better investment decisions, by predicting what the future market might look like based on current data.




Turbine installation and substation progress via satellite

Nikhar Parikh

**PES: Ensuring long-term value from digital mapping goes beyond the initial implementation. In what ways does TGS keep spatial solutions adaptable and up-to-date to ensure continued relevance?**

NP: You're absolutely right; it's not enough to just implement a solution. The world of spatial intelligence is evolving rapidly, and we recognize that our solutions need to evolve alongside these changes.

To ensure long-term value, we concentrate on continuous updates and predictive maintenance, ensuring that the data remains current and accurate. For example, tracking historic wind farm boundaries allows us to offer trend analysis, providing insight into future trends and helping our clients plan ahead. This long-term support ensures our solutions remain adaptive and effective over time.

**PES: Looking to the future, there's clearly a lot of potential for innovation in the field of spatial intelligence. Do you see TGS positioning itself to lead this evolution?**

NP: The future of spatial intelligence holds immense promise. Digital twins, AI-driven analytics, and real-time environmental monitoring are on the verge of revolutionizing the industry, and TGS is leading this transformation by making substantial investments in these technologies.

We are already developing next generation 3D modeling tools and interactive spatial platforms capable of delivering faster, more precise insights. Our overarching aim is to enhance efficiency, sustainability and informed decision making across every sector we serve, ensuring that we not only keep pace with innovation, but actively shape its course.

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