

Renewable Energy Solutions E-guide



**Renewable
Energy
Solutions**



UP TO
70%
REDUCTION
in aggregate thickness,
construction times and
carbon footprint.



**PROVEN
Technology**



**PROVEN
Savings**



**PROVEN
Success**



What will you learn from this guide



01

How you can overcome some of the challenges faced by a developer/consultant or contractor associated with building renewable energy projects, including construction over unstable/soft/poor ground.

02

How Tensar's unique geogrid and subgrade stabilisation solutions can help support renewable project owners, engineers, designers and contractors to reduce costs, save construction time, protect the environment and reduce carbon emissions during the construction of renewable energy projects. This covers sectors such as; wind (onshore & offshore), solar, BESS, hydrogen and more.

03

What the benefits and outcomes for stakeholders are from using Tensar solutions on renewable energy projects.



Introduction to the UK energy landscape



Tensar[®] are a market-leading provider of bespoke solutions used in renewable energy projects for mechanical stabilisation, helping save cost and time on these projects.

Renewable energy plays a key role in the UK energy strategy, as shown by the repeated governmental support through mechanisms such as contracts for difference (CfD's) and the majority of nationally significant infrastructure projects (NSIPs) falling under the energy category (of which most are renewable energy).

This is not only a sector set to continue growth at an accelerated pace in order to meet the UK's 2030 net zero goals, but one which also represents a key shift for the work force transitioning from other energy sectors to the renewable energy sector.

The sector continues to become further de-risked attracting investment and 2024 marked the first year in history where over 50% of energy used in the UK was derived from renewable energy sources, with wind acting as the predominant contributor. Renewable energy in many instances is cheaper than other non-renewable sources of energy, with 2024 seeing a record high number of negatively priced hours.

The UK market is ripe for opportunities in the following sectors: onshore and offshore wind; solar; battery energy storage systems (BESS); hydrogen; carbon capture, utilisation and storage (CCUS); and less dominant ones such as hydroelectric and wave and tidal in certain select zones.

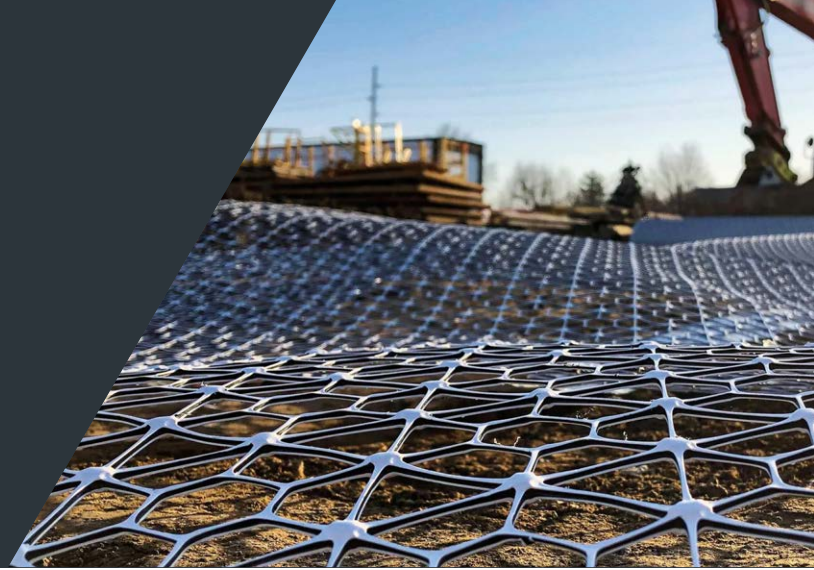
Tensar are a market-leading provider of bespoke solutions used in renewable energy projects for mechanical ground stabilisation. Our solutions can help to save cost and time on these projects whilst reducing the embedded carbon and providing environmental protection compared to alternative construction methods used to stabilise weak ground, allowing a project to be developed in the most challenging geological conditions, such as over peatland.

We still proudly manufacture our products in Blackburn, UK (where we were founded), as well as in the USA and China to minimise transportation emissions for our solutions whilst providing coverage to three major continents.

Tensar have a vast and varied global portfolio of renewable energy projects, tackling a multitude of challenges, leveraging off the 40+ years of global experience and continuous research and development to ensure we offer the most cutting edge and optimised solutions to help our clients with their project needs.



What Geogrids are and why they matter.



Geogrids are high-strength polymer structures designed to stabilise soils by interlocking with aggregate. That interlock creates a composite layer that's stiffer, stronger, more stable and far more efficient than non stabilised fill.

Geogrids unlock performance that cannot be achieved with aggregate alone. You get higher bearing capacity, reduced deformation, and substantial aggregate savings—without changing your construction methods.

Why Use Geogrids?



Tensar InterAx with effective particle confinement and mechanical interlock.

If you're not currently specifying them, you're leaving money and performance on the table. Here's why they've become standard practice across highways, rail, and heavy-duty pavements.

1. Reduced Aggregate Thickness

Mechanically stabilised layers (MSL) incorporating Tensar geogrids are stronger. That means you can achieve the same performance with up to 70% less aggregate, depending on conditions. That's not hypothetical—this has been repeatedly validated in full-scale trials and we have many case studies (linked throughout this document) showing real-world savings. This brings lower material costs, fewer truck movements and a faster build.

2. Improved Performance

The structure holds together better because load is spread laterally rather than punching downward.

The mechanically stabilised layer (MSL) incorporating Tensar geogrid has had extensive testing to prove this superior performance.



Mechanically Stabilised

Non-stabilised

Across a medium-size project, this can translate to six-figure cost savings with minimal design complexity added.

You can achieve:

- ✓ Project specific trafficking and bearing capacity targets
- ✓ Mitigation of differential settlement
- ✓ Subgrade protection during construction and in-service trafficking
- ✓ Improved performance during service life



3. Carbon Reduction

The highest proportion of carbon emissions in construction are associated with the sourcing, transportation and placement of construction materials such as granular fill/aggregate. The incorporation of a Tensar geogrid can reduce road or platform thicknesses by up to 70% and so the carbon footprint of a construction project can be reduced significantly.



Granular particles interlocking with the Tensar InterAx structure.

How Geogrids Work

A geogrid works through particle confinement and mechanical interlock. When a load is applied to a mechanically stabilised soil layer, the geogrid and soil act as a single composite material. The geogrid's open apertures confine particles, allowing them to mechanically interlock with the grid's ribs, forming a mechanically stabilised layer of soil and preventing lateral movement.

Rather than relying on a tensioned membrane effect, modern stabilisation geogrids work through lateral restraint. The aggregate particles become interlocked within the geogrid apertures, creating a confinement effect. This interaction increases the shear strength of the aggregate layer, making it significantly more resistant to lateral displacement and permanent deformation.

By confining the particles, the geogrid creates a mechanically stabilised layer that distributes applied loads over a much wider area of the subgrade. This improves the overall stiffness and bearing capacity of the platform or road pavement, leading to a more durable structure and a longer service life.



More information

<https://www.tensar.co.uk/resources/videos/how-do-you-design-a-geogrid-for-stabilisation>

<https://www.tensar.co.uk/resources/guides/introduction-to-geosynthetics>



Onshore & Offshore Wind Energy



All Wind Energy projects start from the ground

Whether its onshore or off-shore, to get turbines in place and operational requires extensive groundworks: foundations; crane platforms; access roads; laydown areas; and cable runs. All of which involve groundworks for foundations, crane platforms, access roads, and working platforms.

These all present technical problems but also impact on planning constraints, hydrology, ecology concerns and other stakeholder issues.

Typically, the onshore works for off-shore projects are located in areas of marshland or weak estuarine silt. These coastal locations present additional technical problems to your build

Tensar has proven groundworks' solutions, which if considered from the earliest stages of a project, can reduce environmental impact, lower construction costs and address many stakeholder concerns. Below are two of our many case studies showing how we've solved these problems using our geogrid solutions.



Hagshaw Hill
Lanarkshire, UK

34%
reduction
in aggregate
thickness

[Learn more >](#)



Triton Knoll
Lincolnshire, UK

£200,000
savings in total
construction cost
estimated

[Learn more >](#)

Tensar[®] solutions for onshore wind energy

- Access roads (floating roads over peat)
- Working platforms and crane platforms
- Laydown areas and compounds
- Cable trenching support
- Earth retaining walls and slopes

Tensar[®] solutions for offshore wind energy

- Temporary and permanent access roads
- Crane platforms
- Transformer and substation compounds
- Laydown and assembly areas
- Cable trenching and cable pull roads



Solar Energy

Solar Energy Farms

Solar projects are a crucial part of the renewable energy generation mix. The location of these facilities is often away from the existing road network and in remote areas tough to access. Difficult ground conditions are common such as peatland sites and poorly drained land subject to flooding.

This presents geotechnical challenges for multiple site zones during construction, such as access roads (permanent and temporary), substations, working platforms and compound areas.

If considered from the earliest stages of a project, the use of our solutions can allow construction during all weather conditions and reduce or mitigate adverse environmental impacts, speed construction, and lower construction and future maintenance costs. Read more about how in our case study.

27%
cost savings
compared to
non stabilised
solution

39%
aggregate
saved

Cleve Hill Solar Plant
Kent, UK

[Learn more >](#)

Tensar[®] solutions for solar energy farms

Temporary and permanent access roads (paved or unpaved)

Working platforms/
crane platforms

Transformer and substation compounds

Site compounds

Cable trenching





Battery Energy Storage Systems (BESS)



Battery energy storage systems are integral to balance the grid due to fluctuating demand and ensure generating assets can store electricity while the grid undergoes upgrades or in times of excess generation of renewable assets.

They tend to be located where the grid struggles to meet peak demand, or close to renewable energy sources. This often means building on weak soils/brownfield sites close to urban areas.

Also, local communities and infrastructure can be heavily affected during the construction of any major project. Low volume rural roads are particularly at risk from the higher truck loading from construction traffic.

Tensar solutions significantly reduce the volume of aggregate required and material excavated and removed from site. This alleviates the traffic management schedule by reducing vehicle movement on and off site, improving safety — minimising damage and congestion to: local roads and reducing impact on local communities.

49%
savings in
construction
time

Cryogenic Energy
Storage Facility BESS

[Learn more >](#)

Tensar[®] solutions for BESS

Battery
foundation
support

Substation
foundation
support

Noise reducing
perimeter green
slope systems

Temporary and
permanent access roads
(paved or unpaved)

Crane
platforms

Site
compounds

Working
platforms



Hydrogen Plants

Hydrogen will be an indispensable part of the renewable energy mix for the future, with popularity rising as it provides versatile uses, such as for long duration energy storage or to being used as a fuel.

New green hydrogen plants will be located close to renewable energy generating assets and as close as possible to major industry users. This often means building on weak soils, or brownfield sites close to urban areas.

This presents geotechnical challenges for access roads and working areas during construction, and for permanent access over the full working life. Storage facilities will require firm foundations and control of long-term settlement.

More information

<https://www.tensar.co.uk/applications/markets/renewables>

Tensar has proven groundworks solutions, which if considered from the earliest stages of a project, can offer clean rapid construction, lower construction costs, and reduce environmental impact.



Tensar[®] solutions for hydrogen projects

Earth retaining walls (visual and noise mitigation)

Transformer & substation compounds

Temporary and permanent access roads (paved or unpaved)

Cable trenching support

Crane platforms

Foundation support

Working platforms



Access Roads and Working Platforms



Renewable energy projects can't be completed without access roads and working platforms capable of supporting the transit, storage and assembly of heavy equipment and parts.

These are often be constructed over soft and variable soils. Smooth, clean, problem free access roads facilitate problem free construction. Weak subgrades pose the greatest challenge to the performance of access roads and unpaved areas.



Unpaved roads and trafficked areas

Soft soils and poor site conditions are common locations typically available for renewable projects. Repeated traffic across these weak subgrade soils will quickly lead to rutting, resulting in continual maintenance issues, lost project time and additional money spent to fix these avoidable issues.

Fortunately, Tensar geogrids provide a proven soil stabilisation solution that is more cost-effective to construct with than other methods. Construction savings of up to 70% can be achieved due to reduced aggregate alone. It also improves site performance, reduces future maintenance costs, does not affect the site hydrology and minimises environmental impact; providing a greener alternative to chemical stabilisation or geogrids that do not offer the stabilisation properties of Tensar patented solutions.

Crane Operating Areas

Safety is critical when moving, assembling, and operating mobile cranes on construction sites. A safe working platform: smooth, clean and free of ruts (holes) is essential, particularly over weak and variable ground.

Tensar has solutions for the construction of safe crane access platforms over weaker soils. These comprise either a mechanically stabilised foundation layer incorporating multiple layers of Tensar geogrid, or a TensarTech[®] Stratum[®] Cellular Foundation Mattress System to provide a stiff and strong platform.

[Learn more >](#)





The benefits of using Tensar solutions



What are the benefits of using Tensar[®] solutions for renewable energy projects?



Reduced aggregate/granular layer thickness - Granular layers incorporating Tensar geogrid can be up to 70% thinner, with no loss of performance.



Reducing material use in construction results in fewer vehicle movements, which can deliver significant CO₂ emission savings of up to 70% when compared with non-stabilised designs as well as reduce the wear and tear on the roads.



Construction cost savings of up to 70% can be realised due to reduced aggregate cost alone.



Increased load bearing capacity allowing heavier loads to be used.



Operating in areas typically avoided such as peatlands or flood risk zones, giving greater flexibility in location to project developers.



Environmental protection allowing smoother and quicker planning permissions and eliminating or mitigating the effect on the environment.



UK manufacturer – offering the lowest transportation emissions for our stabilisation geogrids in the UK as our manufacturing facility is located in Blackburn and also runs off 100% renewably generated electricity.



Client confidence and trusted partner – Tensar are the inventors of the geogrid and the longest serving geogrid manufacturer in the world, with over 40+ years of experience and a vast portfolio of tried and tested solutions worldwide.



In house technical design support and market leading R&D – our team of experienced engineers is available to assist in the design of Tensar solutions from early project stages down to ready to build projects. Tensar act as a trusted partner, not just a manufacturer of geogrids, offering full design support down to the supply of the Tensar geogrid solutions.



Supply chain reassurance – Tensar have a vast distribution network and use multiple distributors of our solutions not just within the UK but worldwide, to ensure there is always sufficient stock for each project and never a bottle neck.



Decarbonising the construction process



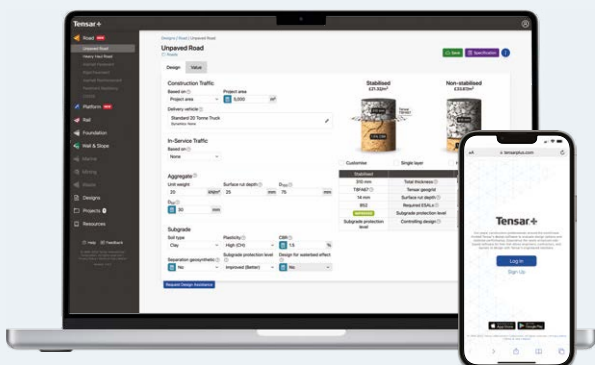
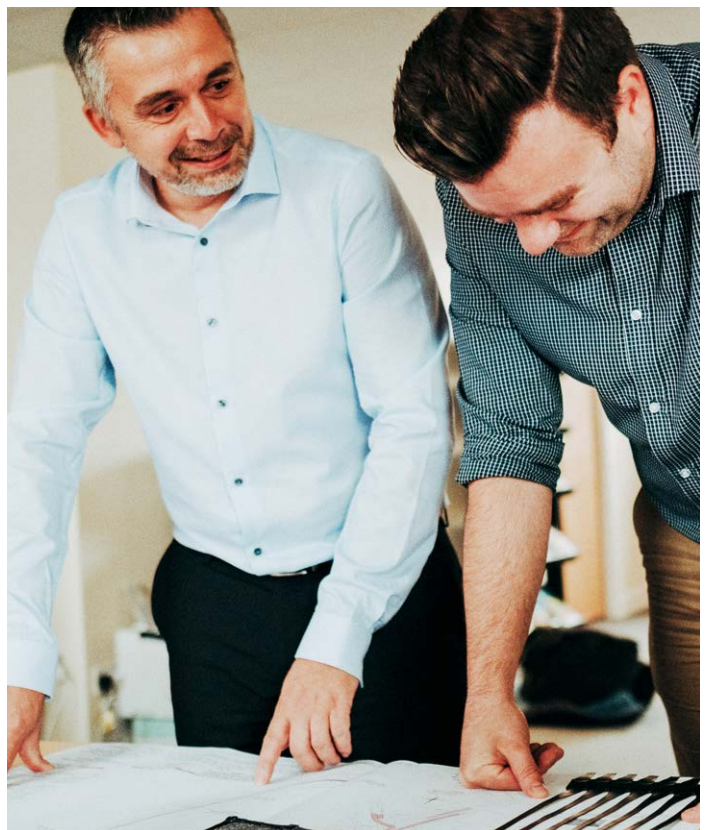
Minimising the construction carbon footprint of any project is beneficial. It is particularly so for renewable energy projects.

Tensar products are manufactured in the UK using 100% renewable energy.

Local production reduces supply chain transportation, and by significantly reducing the volume of quarried aggregate required on a project, Tensar solutions deliver meaningful savings in the total construction carbon emissions — helping to decarbonise the project supply chain.

Every project will impact on the local environment to some extent. Stakeholder concerns will need to be addressed at the planning stage and real measures taken in the design and construction stage to minimise and mitigate impacts on the environment, local infrastructure, and communities.

Read more: <https://www.tensar.co.uk/resources/articles/sustainable-construction-methods>



Tensar solutions, when adopted from the outset, can minimise environmental impacts as well as aid progress towards biodiversity net gain targets.

Tensar

Learn more >



Reducing the impact on local communities

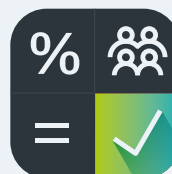
Local communities and infrastructure can be heavily affected during the construction of any major project. Low volume rural roads are particularly at risk from the higher truck loading from construction traffic.

Tensar solutions significantly reduce the volume of aggregate required and material excavated and removed from site.

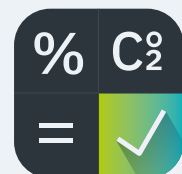
This alleviates the traffic management schedule by reducing vehicle movement on and off site, improving safety – minimising damage and congestion to local roads and reducing impact on local communities.



**Save time,
cost and carbon**
and have a more
positive impact on
the Community
with Tensar



*Positive
Community
Impact*



Carbon Savings



Recycling of Tensar Geogrids



All of Tensar's geogrids and geocomposites are recyclable, reflecting our dedication as a market-leader to meet customer needs and support environmentally responsible practices.

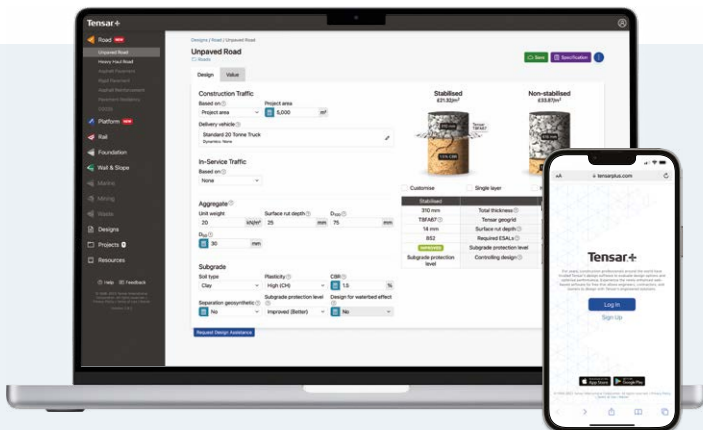
Our geogrids are primarily manufactured from polypropylene or high-density polyethylene materials that are widely recycled across a growing number of industries. Tensar geogrids do not leach harmful substances and do not contribute significantly to microplastic pollution, so if removal of the geogrid is not necessary, we suggest leaving it in place. This approach retains the stabilisation benefits over the long-term and is often the most environmentally friendly option.

Recycling

Polypropylene and high-density polyethylene, the primary materials in Tensar geogrids, are widely recyclable and versatile. They can be repurposed into numerous everyday products, such as garden furniture, bottle caps, and automotive components.



Granulated Geogrid, ready for re-use.



Tensar solutions, when adopted from the outset, can minimise environmental impacts as well as aid progress towards biodiversity net gain targets.



[Learn more >](#)



How to remove and recycle geogrids

1. Remove Excess Aggregate:

Remove as much aggregate as possible from above the geogrid, leaving no more than 50mm of aggregate on the grid. Contact your aggregate supplier to explore recycling options or repurpose the material for another project.

2. Remove the Geogrid:

Use a digger/excavator bucket to hook underneath the nearest section of the geogrid by inserting the teeth through as many apertures as possible to extract carefully. Alternatively use a grapple type attachment to grab the geogrid and/or geocomposite; Pull upwards while shaking the grid to dislodge any aggregate that remains interlocked with the grid. Repeat this process until the entire geogrid has been removed.

3. Transport to Recycling Centres

Place the removed geogrid into an open-top skip/dumpster. Compact the removed grid to optimise shipping and minimise transport trips, reducing CO₂ emissions. Compaction can be done using bundling equipment or by placing heavy equipment (e.g., an industrial weight or digger bucket) on the grid while in the skip/dumpster.

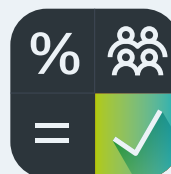
4. Recycle the Geogrid

Send the compacted geogrid to the nearest industrial polypropylene recycling facility. Some facilities may offer monetary compensation for the material.

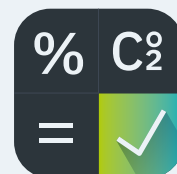
Once transported, the geogrid is typically cleaned and processed into granules (see figure on facing page as an example), to be made ready for re-use in new products.



**Save time,
cost and carbon**
and have a more
positive impact on
the Community
with Tensar



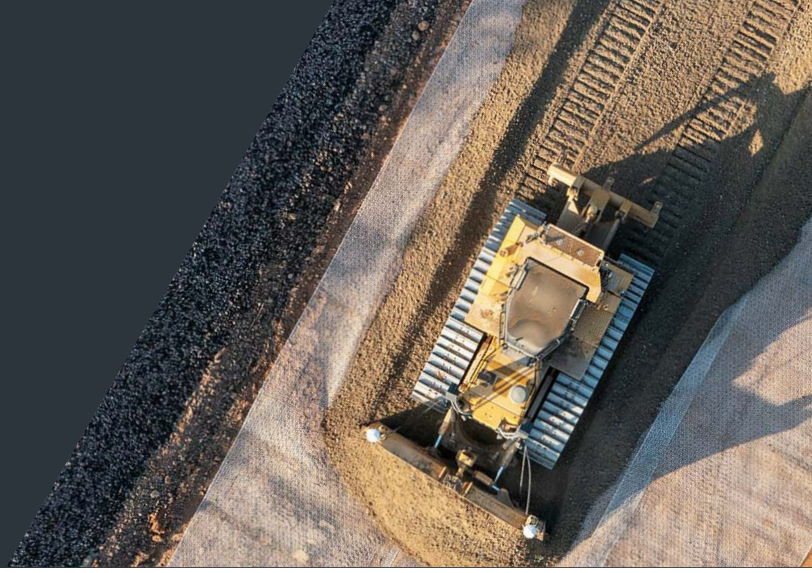
*Positive
Community
Impact*



Carbon Savings



Supporting you to design your project



A project is about more than a simple product choice – it's about a design that meets the owner's needs, lowers costs, improves design life, and protects your reputation. In other words, it's about the total value you receive from a partner committed to making your project a success.

At Tensar, we go beyond merely selling products. Our team of trained engineers and sales representatives can be here for you from the start of your project to its completion and anywhere between. As your partner, we bring expert advice and award-winning software that allows you to create and defend specifications more easily and design with greater confidence.

Tensar's in-house engineering design team can offer various services: from a free of charge "Application Suggestion" to illustrate what Tensar can achieve and how much value can be added to your project, to a more refined and detailed design using Tensar solutions.



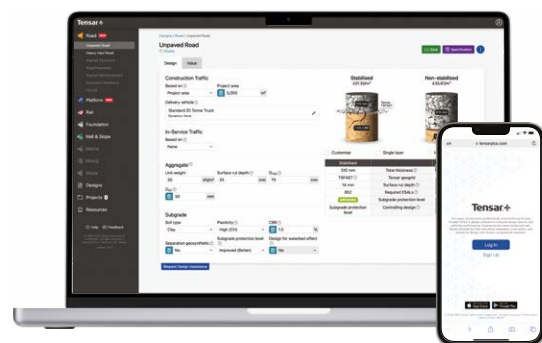
Tensar+ Geotechnical Design Software

Tensar+ is a free, cloud-based geotechnical design software that allows engineers, contractors, and owners to design with geogrid in a variety of applications. The newly enhanced design solution features a simplified user experience with all the features engineers have come to expect and depend upon with Tensar geotechnical software.

Use the platform to design your project, customise its specifications and see the cost-savings in real time.

The Tensar+ geotechnical design software platform enables you to:

- ✓ Design and evaluate project specs
- ✓ Compare alternative materials and project conditions
- ✓ See the cost and time savings in real time as you change parameters
- ✓ Analyse the sustainability of your projects.





Viking Wind Shetland, Scotland



The Viking Wind Farm in Shetland is the UK's largest onshore facility by output, and one of the world's most productive onshore farms. Most of the site is located on peat and blanket bog. From the earliest planning stage, 'floating roads' using geogrids were proposed as the most environmentally appropriate solution for access. Tensar supplied approximately 350,000m² of geogrid to stabilise the floating roads and support cabling throughout the site.

Floating roads were proposed from the earliest planning stages as an alternative to peat removal and backfilling with rock. The use of Tensar stabilisation geogrid minimised the construction thickness for over 16km of floating road. This greatly reduced hydrological impact on the surrounding peat and the volume of rock fill to be transported. Tensar geogrid was also used in the base of cable trenches to stabilise the bedding and minimise support fill thickness, thereby reducing trench depths and limiting disruption and hydrological impact to the peatland.



Roads and Platforms
№ 476

Building the UK's most productive onshore windfarm

Viking Wind
Shetland, Scotland

The Viking Wind Farm in Shetland is the UK's largest onshore facility by output, and one of the world's most productive onshore farms. Most of the site is located on peat and blanket bog. From the earliest planning stage, 'floating roads' using geogrids were proposed as the most environmentally appropriate solution for access. Tensar supplied approximately 350,000m² of geogrid to stabilise the floating roads and support cabling throughout the site.

Benefits

- Democratised a practice approach to construction** by allowing floating road design to be developed and commercialised, the benefits of stabilisation geogrids were demonstrated.
- Reducing planning objectives** related to disturbance, regarding peat loss, carbon dioxide release and the impact of large earthworks which were eliminated by the use of floating roads.
- Minimised environmental impact** through the reduction in peat loss.
- Limited hydrological disruption** to use of gravel fill, limited to the gravel and rock fill.
- Reduced fill quantities** leading to reduced transport cost and emissions for contractors.

CLIENT'S CHALLENGE

To build and maintain the UK's largest onshore windfarm required construction of long distances of access track and buried cabling. The location of the farm was a remote area of peat bog posed additional challenges. Rock fill required was readily available from borrow pits close to the site as material cost was not a big issue. However, environmental disruption had to be kept to a minimum to satisfy stakeholders and interest groups. This required a solution that saved time and cost, and any hydrological impact on the peatland.

TENSAR SOLUTION

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Tensar.

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[Download Case Study >](#)

The benefits of using Tensar® geogrids in sustainability projects

Access Track

With geogrid

Without geogrid



44% reduction in thickness (Typical)

Compound Area

With geogrid

Without geogrid



50% reduction in thickness (Typical)

Permanent Roads

With geogrid

Without geogrid



50% reduction in thickness (Typical)

➔ Access roads

➔ Working platforms

➔ Crane platforms

➔ Cable pull roads



Products and Systems

Tensar's Renewables Related Products & Systems



Tensar[®] InterAx[®] (NX) Geogrids

Our highest-performing geogrid, combining coextrusion, advanced material science, and optimised geometry. Tensar InterAx provides the best performance for unpaved roads, working platforms and other trafficked areas.

[Learn more >](#)



Tensar[®] Basetex[®] Geotextile

High-strength Polyester geotextile for reinforcement applications.

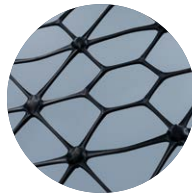
[Learn more >](#)



Tensar[®] Geocomposite

Composite product family combining confinement properties of a stabilisation geogrid with the added benefit of a nonwoven geotextile.

[Learn more >](#)



Tensar[®] H-Series (HX) Geogrids

Tensar's new H-Series family of geogrids provides improved performance over Tensar TriAx geogrids for use in unpaved road applications.

[Learn more >](#)



TensarTech[®] Stratum[®] Cellular Foundation Mattress System

A continuous deep cellular foundation mattress structure assembled and filled on-site.

[Learn more >](#)



Selected Success Stories



Cleve Hill
Solar



[➤](#) Hagshaw Hill
Onshore Wind Farm



Viking Onshore
Wind Farm



[➤](#) Cryogenic Energy
Storage Facility BESS



Stranoch Onshore
Wind Farm



[➤](#) Wood Walton
Solar



Read other useful articles on renewable energy projects here:

www.tensar.co.uk/applications/markets/renewables

www.tensar.co.uk/resources/articles/how-can-windfarms-be-even-greener

www.tensar.co.uk/resources/videos/tensar-interax-geogrid-product-and-features-video

www.tensar.co.uk/resources/articles/sustainable-construction-methods

www.tensar.co.uk/resources/articles/delivering-sustainable-solutions-for-wind-energy-sector-with-geosynthetics

www.tensar.co.uk/resources/guides/floating-roads-on-peat-guidance

Get in touch

If you would like to know more contact our renewable energy market manager to discuss early stage challenges down to ready to build project aspects.

umberto.bizzaro@cmc.com

If you are a consultant/ contractor or merchant - Contact Tensar for further information on how we can help with your renewable energy projects:

tensarinfo-uk@cmc.com

let us help you with your next challenge: tensarinternational.com email: tensarinfo-intl@cmc.com



We're CMC. You'll find our products strengthening and reinforcing the infrastructure nearly everywhere on the planet – in sports stadiums and public buildings as well as highways, bridges, railways and other structures. To serve this global market, CMC maintains facilities across the United States, Europe and Asia. These sites include everything from local recycling centers, steel mini-mills and micro-mills to large-scale fabrication centers, heat-treating facilities as well as other operations. **cmc.com** ©CMC 2026