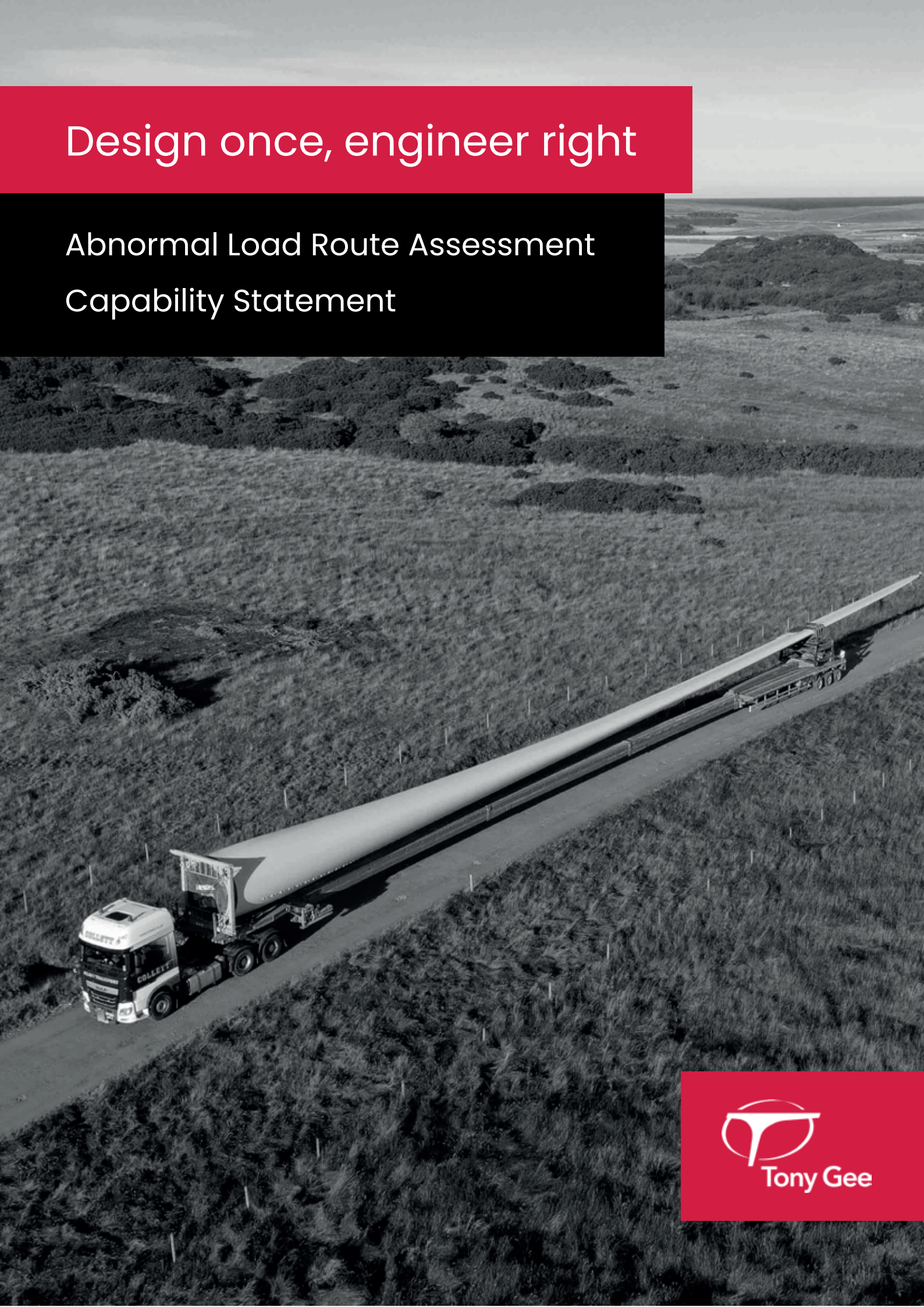
Design once, engineer right

Abnormal Load Route Assessment Capability Statement



Tony Gee

Why Tony Gee?

Design once, engineer right

Our work is always the best it should be, anticipating challenges and revealing possibilities, avoiding waste and better serving the needs of society and the environment - for today and the future

Leanamore Wind Farm

Tony Gee has been adding value to design and infrastructure solutions for over 50 years. Our core business has been established by working with clients, contractors and other designers to complex design and build civil engineering projects. We have developed an extensive capability in both temporary and permanent works design, focussing in particular on integration of design with construction.

Our reputation has been built through the delivery of innovative and alternative designs that have taken into account the employment of construction methods, modern and innovative techniques as well as the effective use of materials. Our approach is always to work alongside our client to consider robust, combined solutions, designing both permanent and temporary works together. We have extensive knowledge and experience of working for contractors across the globe, recognising and understanding the logistical challenges associated with major infrastructure schemes.

Our size allows us to be flexible and adaptive to our clients changing needs and this combination of skills enables efficient, innovative and economical designs to be produced - a fact recognised by our involvement in major UK and international projects.

We employ highly qualified and experienced staff and engage in a progressive training programmes to develop a broad range of skills across all disciplines. Coupled with advanced design and BIM software the practice has developed a reputation in the industry for delivering efficient, innovative and economic designs delivered on time. We undertake independent checking of complex solutions and construction methodology for every engineering solution. All civil, structural and geotechnical engineering is carried out in house and Tony Gee has a mature supply chain for the delivery of other specialist disciplines.

Our background:

- Experience in all types of structures, temporary works, marine and rail environment and MEIC interface
- Contractor's designer - appreciation of the needs of a fast-track design and build environment
- Significant and award-winning project experience
- Directors are "hands on" engineers and will have significant involvement
- Construction engineering and temporary works specialists - constructability check comes "as standard"
- We always seek to add value where possible design process
- Highly experienced technical teams exercising regular peer review

Our Key differentiators and USPs:

Collaborative - Experience in working with clients and contractors on complex projects for many years

Flexible - Flexibility and responsiveness in service delivery

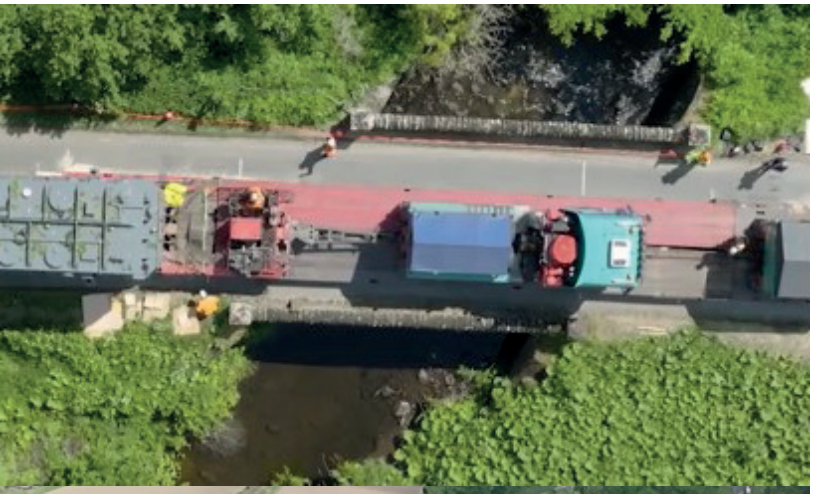
Experienced - Expertise and experience in infrastructure design including, value engineering, construction methodology and design integration

Sustainable - Substantial design and technological resource

Understanding - Understanding of construction risk in the design process methodology and design integration

Technical - Highly experienced technical teams exercising regular peer review

Route Assessment Expertise



Structural Assessments

Since being founded 50 years ago, Tony Gee has worked on transport infrastructure across the UK in the highways and rail sector. Much of this involves working with existing structures, quantifying their available capacity to support ongoing and new traffic forces and designing alterations and new structures. In our work for the Power sector we have experience of assessments for specific loads and axle arrangements and working closely with hauliers.

Road Widening

Tony Gee is active in the planning and design associated with highways alterations. Road widening requires swept path analysis, careful identification and consideration of existing constraints and detailed highways design.

Bridge Design

Tony Gee provides bridge structural specialists with experience of all the different bridge types. Working closely with civil engineering contractors, we provide pragmatic, buildable solutions.

Transport Logistics

Tony Gee has developed innovative methodologies for transport route assessments to deliver major components from port to site including the use of 3D swept path analysis. We have extensive experience in the design of upgrades to all aspects of a transport delivery route from port improvements, public road improvements and on site infrastructure.

Temporary Works

Tony Gee provides the full range of civil engineering design services for clients including assisting with the construction methodology by planning the temporary supports required for implementation. This could be design of propping, jacking, scaffolding, falsework temporary stability checks etc.

Rail Interface

Tony Gee is the designer of choice for many Tier 1 contractors in the rail sector and has worked extensively on designing and assessing bridges on the Transpennine Route Upgrade. Familiar with the Network Rail approval processes, Tony Gee can provide expertise and guidance in the rail world to clients clearing routes for abnormal load movements.

Knocknagael, Tomatin Public Road Improvements

Key points:

- **Access junction and drainage design**
- **Road widening works**

Tony Gee carried out public road improvement works to three sections of public highway. These were at:-

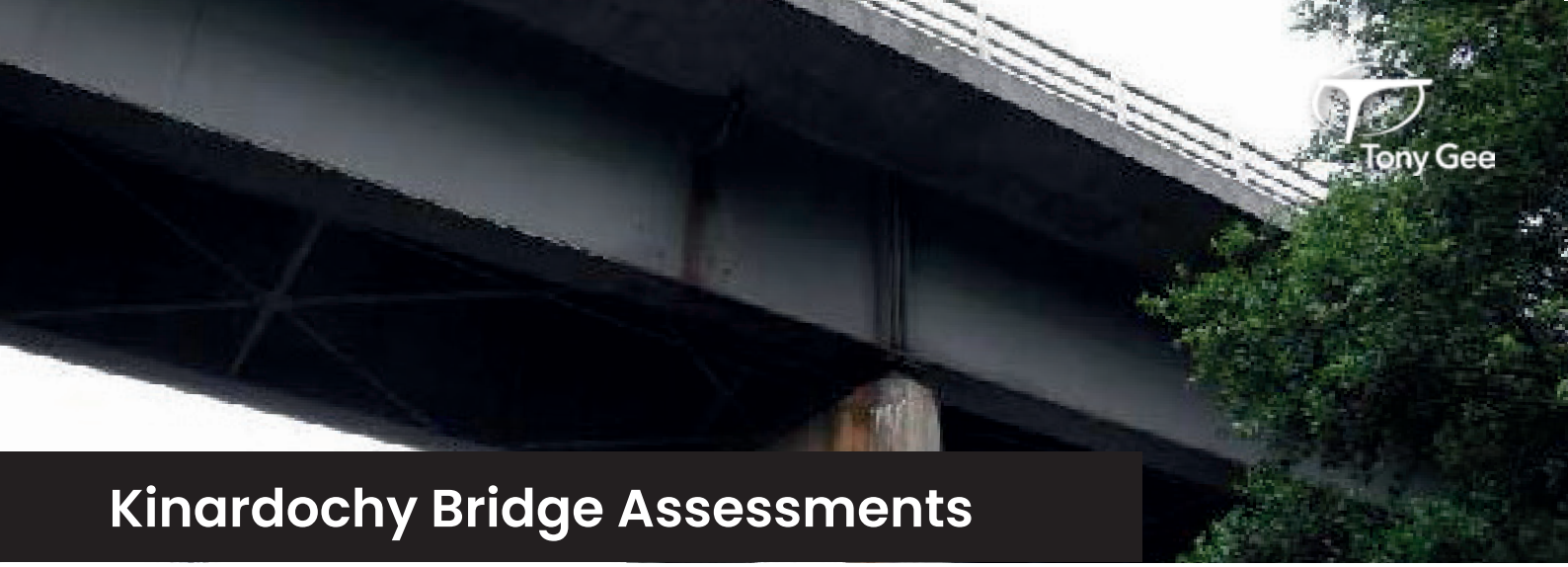
- B861 Inverness to Inverarnie road - widening and/or passing places were considered north of Gask House. Mitigation measures were also designed for Dunlichity Cross Road due to poor visibility in this location.
- U1116 Farr to Garbole Road – the horizontal and vertical alignment of the existing road was assessed to ensure that sufficient passing places were provided to improve intervisibility and spacing requirements.
- B851/A9 Farr junction – a section of single track road was identified 320m long which required widening between the A9 junction and the B851/B861 junctions.

In addition to the longitudinal improvements over a 5.6km length the commission also included the design of 12 bellmouths to provide construction access to the new OHL. The bellmouths design included earthworks, drainage, pavements, signage and road markings.

Following several rounds of meetings with the Transport department of Highland Council the final solutions for each location were detailed and submitted for section 56 & 75 agreements and following that the design was issued for construction to SSE.

A design basis statement was carried out to define proposed standards and procedures for the commission. Through regular discussion with THC and SSE the design was reviewed and refined as the proposals were developed. This meant that by the time the submission for consents was made the design was fully developed with construction details, models, specifications and setting out details issued for construction immediately following consent approval.

End Client: SSE Networks



Kinardochy Bridge Assessments

Tony Gee was initially engaged by SSE to liaise with BEAR NW, BEAR NE and Perth and Kinross Council to identify all structures along the transformer route and confirm which structures required assessment.

Twenty eight structures were identified, many of which were small span masonry or concrete structures on the local roads.

Tony Gee were later engaged with to undertake the assessments on the six larger structures within BEAR NW and BEAR NE. The largest of which being the M90 Friarton Bridge which is a multi-span high level viaduct consisting of 9 spans with the longest span being 174m.

Phase 1 – considered a comparative assessment of the load effects on the unique longer span bridge structures along the route where a simple load comparison would not suffice.

The comparison was undertaken using LUSAS analysis software between the load effects from the transformer loads and the existing bridge rating loads which for each bridge were determined from previous assessments.

Any structures which failed the Phase 1 assessments were further analysed and checked against the calculated capacity of the structure. For the A9 River Tay Bridge, cracking was observed in one of the pierheads close to the bearings in the latest principal inspection report, therefore we specified further inspection and found the pierhead concrete edge to be spalled around the bearing which could not be justified to take the loads from the transformer move. We specified remedial action which involved temporary jacking adjacent to the bearing to ensure a load path to sound concrete on the pierhead during the move.

Key points:

- Six structure assessments
- LUSAS analysis software
- M90 Friarton multi-span high leve viaduct assessment

Contractor: SSE Networks

End Client: SSE Networks

SSE Consultancy Framework

Key points:

- **Various design services as part of initial three year framework**
- **Tony Gee services retained on framework for an additional two years**

Tony Gee has been working with SSE Transmission on a framework for services on the Transmission and DNO networks north of Perth since 2013. The services ordered through the framework are varied but fall under the following broad headings:

- Access and drainage works to Transmission Grid sub-stations
- Public Road Improvements
- Public Road Delivery Route Assessments for grid transformer components
- Bridge assessments
- Junction design for access/egress to the public road network
- Structural inspections and assessments
- Flood Risk Assessments

Tony Gee's collaborative culture has assisted on a number of occasions to bring forward viable and innovative solutions. Tony Gee has sought to bring the benefits of BIM level 2 processes with the production of integrated models. These have been used in planning applications, consultations with third parties and discussions with SSE's contractors. The approach to the framework has been to provide senior, well experience staff to the various commissions together with creative thinking and simple presentation of the technical details, thereby bringing clear strategies for the engineering works required on each commission.

End Client: SSE Networks

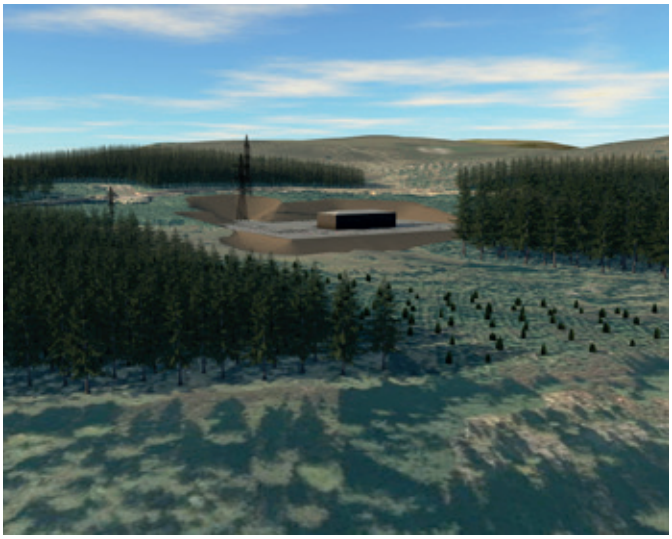
Tomatin 275 / 132kV Substation

Starting initially under the SSE framework, Tony Gee assessed 19km of road near Inverness and developed designs required to identify and agree with the Highland Council road works to enable the overhead line construction. Tony Gee proposed safety improvements and mitigation of poor visibility and layouts to several areas of road, as well as road-widening, and upgrading and constructing passing places as required. Passing places were spaced minimum 150m apart at intervisible locations with design progressed initially using OS map data and later topographical surveys were procured by Tony Gee.

On a separate commission for I&H Brown, we also designed abutment extensions for a water course bridge crossing on the access to the substation. The existing Farr Wind Farm access bridge required some modification. We designed abutment extensions for the deck level to be raised to suit the vertical clearance parameters for the girder frame trailer arrangement used for the transformer delivery. The work involved assessing the stability of the existing abutment and providing a design for pre-fabricated steel abutment extension as well as details of the bolted connections to the existing abutment.

Key points:

- Roads, drainage and earthworks design services
- Worked with two separate clients on the scheme



Contractor: RJ McLeod / I&H Brown

End Client: SSE Networks

Garve Hill Access, Rosshire

Key points:

- Junction design to TD41 of the DMRB
- Geotechnical and drainage design
- Site supervision
- Procure and co-ordinate Stage 2 and 3 Road Safety Audits

The Garve Hill Access was constructed to facilitate the construction of the Beauly-Mossford twin 132kV circuit upgrade. The work was required to upgrade an existing forestry access off the A835 Tore to Ullapool Trunk Road.

Our long established relationship with Transport Scotland allowed us to quickly agree the key technical issues to be resolved to gain approval for the access. This was done by direct consultation with TR:NM (network management) to agree.

A key constraint on the drainage solution was the capacity of the existing culverts and drainage on the A835. The capacity of the existing culverts was assessed and the design was developed with hydrobrakes to ensure that the new system did not increase the flow through the culverts.

The geotechnical design and construction of the slope was complex. The design was therefore developed to provide the contractor with a wide range of solutions which could be deployed for the retention of the slope. A schedule of rates was compiled as part of the contract documentation and we supervised the construction of the slope by providing direct instruction to the contractor on site to confirm which areas of the slope should use anchors, which should be soil nailed and where buttressing should be used.

End Client: SSE Transmission

Solwaybank Wind Farm, Dumfries & Galloway

Key points:

- Design of the River Sark bridge crossing
- Delivery route assessment and public road improvement design

Solwaybank Wind Farm is a 15 turbine, 37.5MW scheme near the towns of Lockerbie and Langholm in Dumfries and Galloway.

Tony Gee was commissioned by Jones Bros to design the above elements of the project and provide construction support services.

A key feature of the scheme was the 15m span River Sark Bridge crossing. This was on the critical path for the construction of the site wide infrastructure. We developed a design that facilitated the superstructure and deck being lifted in to place in a single operation. The abutments were also designed with pre-cast elements. This minimised the site operations and construction programme.

Swept path and public road improvement works were undertaken along the wind turbine component delivery route. This work included widening to the existing B657 and site access junctions of the B657.

Contractor: Jones Bros

End Client: RES

Afton Wind Farm

The site has 27 Wind Turbine Generators (WTG's) each with a maximum capacity of up to 2.75MW. Ancillary infrastructure including; crane pads, access tracks, control building and substation, and temporary construction compound and turbine lay down area were also proposed.

Tony Gee provided civil, structural and geotechnical design services for the scheme, including:

- Onsite access tracks (11km)
- 7km public road improvements from New Cumnock to the site boundary including managing the interface and design of protection measures to Scottish water trunk mains
- Twenty-seven WTG hard standing and associated turning heads earthworks design
- Three box culvert designs on the spine road of Afton road into the site

Tony Gee was also responsible for providing geotechnical support, GI scoping and site inspections for crane hard standings and infrastructure. Tony Gee produced a schedule of conflicts that identified all conflicts between the existing water mains and the new passing places/road widening. Some widening and passing places were then re-positioned to avoid the mains and thus eliminate the conflict; however the exact location of the mains in relation to the road was largely unknown. A Ground Penetrating Radar (GPR) survey was therefore commissioned by Tony Gee to confirm the exact pipe locations which enabled a further number of conflicts to be eliminated or reduced.

The risk associated with the remaining conflicts was determined through a Ground Movement Impact Assessment Report by Jacobs. A pipe protection plate proposal designed by Tony Gee was proposed for the sections of pipe which were deemed still at risk, later approved by Scottish Water and the Ayrshire Roads Authority (ARA), whose requirements for the passing place locations also had to be met. Through working as part of a team, the requirements of the DOMS procedures were met and approval from both Scottish Water and ARA achieved with no undue delay.

Key points:

- **Road widening designs to accomodate swept path**
- **New box culvert structural designs**
- **All design solutions complied with Scottish Water's Distribution Operation & Maintenance Strategy**

Contractor: Farrans

End Client: InfraRed

Beauly Cluster Substations

The Beauly substations cluster includes the proposal of four power substations (Deanie, Culligran, Aigas and Kilmorack) in the Scottish Highlands which will replace existing hydropower substations that are to be decommissioned. The project was commissioned by SSE. Tony Gee were instructed to undertake the preliminary civils design of the substation compounds and carried out route asssessment involving review and assessment of structures and passing place design.

A variety of structures were assessed, from masonry and concrete arches to reinforced concrete integral bridges and many culvert structures and retaining walls adjacent to the road.

Tony Gee provided design drawings, reports, earthworks and drainage strategies, drainage impact assessments, and documents from subconsultants, the scope of which included:

- Platform layout and earthworks design
- Platform drainage design and drainage design around the platform
- Delivery route assessment for large transformers
- Production of drawings which include Tony Gee and SSE designs

Environmental considerations to minimise wastage and ecological disruption, providing a more sustainable project delivery outcome was a key consideration. This included the optimisation of cut and fill volumes and specifying re-use of excavated granular fill to minimise offsite disposal, identifying contamination and recommending ways to manage this through targeted local ground investigation, and also ensuring retention of existing ecological features such as ponds, ancient woodlands and trees, shaping the works which considered each of these factors.

Key points:

- **Substation platform civils design**
- **Value engineered solution**
- **Management of multiple subconsultants**
- **Route assessment review**

Contractor: SSE Networks

End Client: SSE Networks

Black Bridge Assessment

Black Bridge, located in Kilmorack, was constructed in 1964 and consists of four spans of 13.7m, 19.8m, 19.8m, 13.7m. Each span is simply supported, and of prestressed concrete beam and slab construction and carries the C28 over the River Beauly, near the Kilmorack power station. Tony Gee was appointed to carry out an independent check of bridge strength and structural analysis.

The bridge is found to be in poor condition with significant spalling to some of the beams and crossheads. The bridge is proposed to be used by special vehicles transporting transformers to the new converter station and switching station near Beauly. The combined loading from the vehicles and their load will be up to 380t. The client's lead assessor carried out a drone survey, produced the AiP document and the assessment report. Tony Gee reviewed the incoming information, provided comments on the AiP and carried out independent calculations to verify the assessment report.

3D finite element grillage modelling was used to distribute the transporter forces across the structure. The calculations were in accordance with the National Highways standards including CS 451. The assessment and check ultimately confirmed the structure was understrength to support the required loads.

Tony Gee worked with the lead assessors to develop results both parties could agree on whilst maintaining an independent structural model, calculations and set of results.

Key points:

- Independent checks
- 3D element grillage modelling
- Concrete bridge assessment CAT III check

Contractor: SSE

End Client: SSE

Carnaig Assessment

Key points:

- Site visit and high-level condition review
- Assessment of 9 structures
- 3D Grillage model used

Tony Gee carried out assessments on 9 structures including corrugated steel buried arch structure for abnormal load vehicle for transporting a transformer. Load comparisons were used for the Level 0 assessments on 12 structures through which 9 had passed. A grillage model was used to assess for the Level 0 assessments.

Outline assessments screened some structures out as they were shown to be able to support the load.

Three detailed assessments (Level 1) were carried out of prestressed concrete decks (15m span at Auchenduich & 13m at Evelix) and an RC deck (10m span at Ospisdale) which was more complicated as the deck was propping the abutment walls.

The route of the abnormal load was along the A9 from Port of Nigg to Carnaig substation. A single lane section of highway 10km long was assessed for widening and passing places for construction traffic and abnormal load movement in accordance with DMRB. Passing places were designed with a 200m spacing requirement and liaising with the contractor to arrange the Construction Traffic Management Plan.

Contractor: Murphys

End Client: SSE Networks

Emmock-Hurlie Civil Works

Key points:

- Public road improvements to facilitate access to overhead cable route sites
- 300km of road assessed for Swept Path Analysis – 200km of road required improvement
- 160 bellmouth junctions, 300-400 passing places required.

The preliminary assessment has been completed which involved assessing 300km of public road for the ability of a crane and construction traffic to pass down the lanes. A driven topographical survey was commissioned and used to define the edge of the carriageway, and a swept path analysis of the routes was completed. This identified that 200km of roads needed widening to allow the crane to pass along and passing places are required to facilitate passing public traffic. 160 bellmouths onto the public road to access the cable route temporary access track are required and approximately 350 passing places are proposed.

In the next project phase, micro-siting is now ongoing. Structural assessments (77no.) will need to be undertaken in the next phase. The crane is an abnormal load.

A PSSR, preliminary sources study report was undertaken for geotechnical requirements identifying where SSSI's, other sensitive sites, contamination and flooding constraints may exist.

Contractor: Balfour Beatty

End Client: SSE

Kennoxhead Wind Farm

Tony Gee optimised detailed design and temporary works for the delivery, installation and operation of thirteen 4.8MW Nordex Wind Turbine Generators within a new wind farm complex situated in a highly inaccessible and remote rural locality. Design elements included the turbine foundations, substation substructure, superstructure and operational platforms.

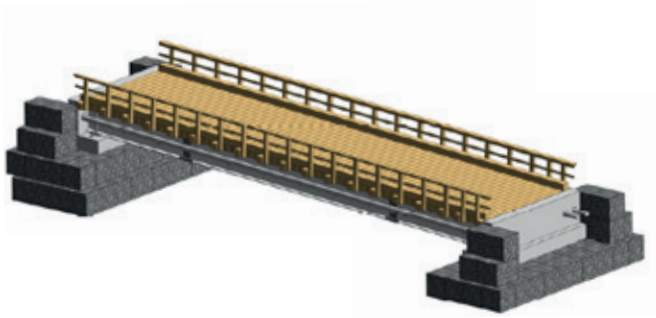
Route structural assessments were carried out by Tony Gee on a number of structures on the public road for the turbine blade and generator deliveries including RC culverts and concrete arches. The bellmouth forming the connection to the public road from the private access track was designed by Tony Gee to allow for a temporary widening when large deliveries were brought to site off the B7078.

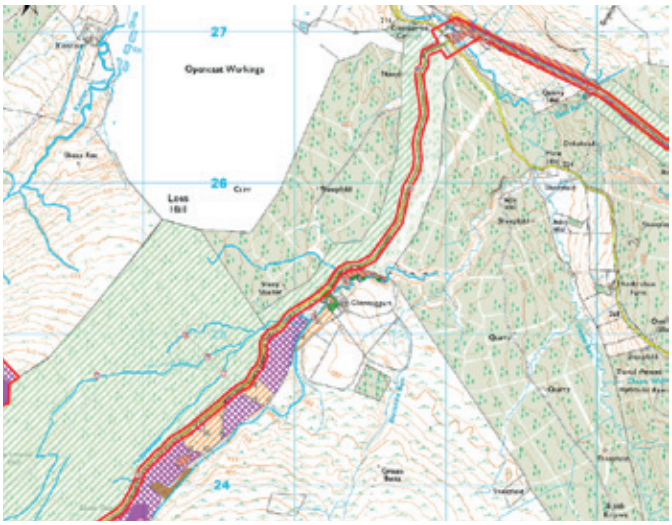
Rock cuttings, track widening and unbound pavement make-up were designed by Tony Gee. The pavement thickness was designed to be varied depending on the achieved CBR values to minimise imported material volumes.

Glespin Bridge was designed using steel girders with a timber deck and gabion baskets to support the RC abutments. The design utilised locally won material that simplified logistics and minimised environmental impacts whilst providing a robust design that fully met design life specifications.

Key points:

- Design of wind turbine generators for a new wind farm complex
- Site routing and working platforms for oversize vehicle delivery and heavy lift cranage
- 11.8km of newly constructed access track with an additional 14km of upgraded existing access track/roads including a new single span permanent bridge structure over the Glespin Burn.





Contractor: Jones Bros

End Client: Orsted

BIM Capability

Tony Gee has extensive BIM capabilities using a range of BIM tools, software and processes. Our BIM processes and procedures are aligned with industry standards defined in BS EN ISO 19650 parts 1 and 2 along with the current suite of PAS 1192 documents. Working closely with our Clients to understand their digital requirements on each project, we utilise our experience and industry best practice to develop innovative and efficient design solutions using our digital engineering capabilities.

All of our projects are modelled in 3D which allows us to effectively communicate our designs and resolve clashes or design issues before construction starts on site. Following this core principal has allowed us to add value at any stage of a project from early concept through to detailed design.

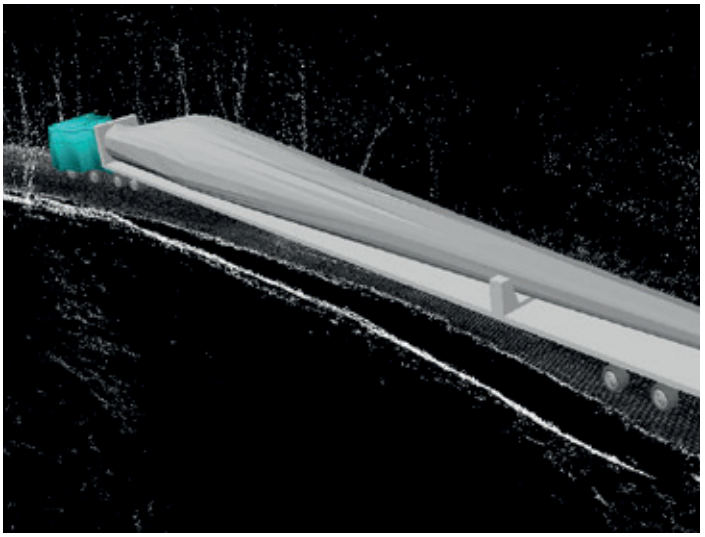
By demonstrating the design options using Civil 3D and Infraworks, we can quickly get to final design solutions that are resource efficient and buildable. By including all project constraints in a master Infraworks coordination model we can ensure all aspects on the project are considered in the design. Fast model iteration along with clear communication of design intent ensures we can deliver the right solution at any stage of the project.

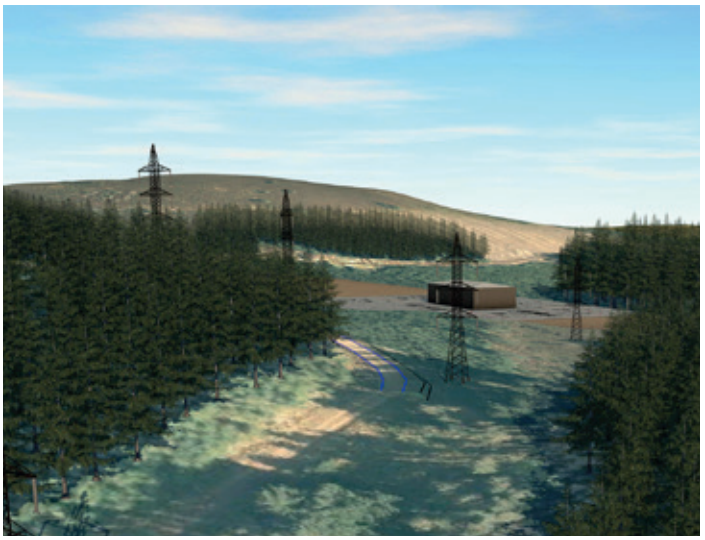
Giving stakeholders, approving bodies and all project collaborators access to the 3D models has proven to improve approval and acceptance of designs. This streamlines the design process and ensures all project participants have the opportunity to comment and review in a collaborative environment.

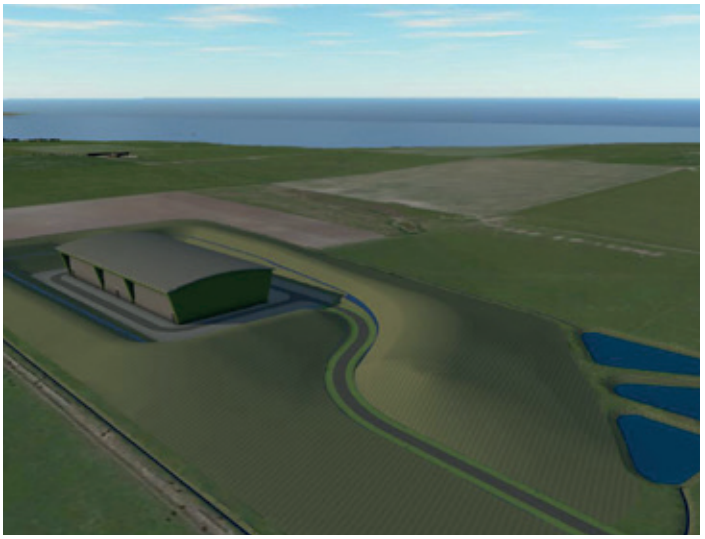
Our 3D modelling of detailed construction elements ensure on site clashes are significantly reduced. This not only saves on construction costs but significantly reduces construction programme risk. Having detailed 3D models embeded with component parameters and information assists the constuction teams on site. These models can be used for daily works discussions, construction phasing and health and safety briefings.

As all our visualisations and 3D coordinated models are a direct representation of our designs, we are confident the 3D models and visuals we produce will reflect what is built on site. We follow this principal from concept stage to detailed design as this adds significant value to any project.

Over the last few years we have given a number of presentations and workshops to a variety of SSE's departments on BIM and demonstrated industry best practice to help SSE on their digital engineering journey.







Our Engineering Team

All of Tony Gee's engineers have engineering degrees. The rest of the technical team is made up of BIM technicians, all of whom possess the relevant qualifications pertaining to their roles (HNC, HND etc). Recruitment is driven by the requirement for the very best engineering intellect and we therefore recruit students at a variety of top universities and offer them sponsorship throughout their course.

Tony Gee prides itself on a low staff turnover. the reasons for this are a comprehensive benefits package, the opportunity for career progression, a varied workload and excellent working environment, exemplified by our appearance in the highly profiled Sunday Times 100 Best Companies to work for listing.

Our culture shapes everything we do, from how we approach challenges to how we interact with one another and our environment.
It's defined by six key principles: Curiosity, Respect, Excellence, Agility, Teamwork, and Empowerment.

Tony Gee has structures teams experienced with structural designs and assessments for the Highways sector in all our offices. We are familiar with the Specification for Highways Works and the Design Manual for Roads and Bridges used in designing and assessing highways structures. Group directors with specialist structural skills are located in each office and are supported by engineers and CAD technicians to develop designs and assessments.

Each office also contains engineers with geotechnical expertise that can advise on the exposure of any structure to geotechnical risks. If required, the geotechnical resistance of a structure can be analysed by our teams.

When we assess or design a structure, where a Category II level of check is required, we can carry out the check in a separate office to maintain an appropriate level of independence. From time-to-time, our international offices can provide a level of flexibility and independent oversight that can overcome any temporary constraints across our UK offices. Cat I checks are completed with a director and engineer separate from the assessing team. We have strong relationships with a number of other leading structural engineering consultancies with highways bridge specialisims with whom we can contract with to provide Category III independent checks, when required.

Key Team

Peter Clay

Group Specialist Director

CEng, MIStructE

35 years experience

Peter is the technical structures lead in the Stonehouse office and has a long experience of assessing bridges particularly in the rail sector but also for highways such as the St Georges bridge carrying the M5 over the railway near Bristol. He is able to lead assessment teams or provide key technical input when required.

Riccardo Stroscio

Group Specialist Director

CEng, FIStructE

30 years experience

Riccardo is a technical expert in bridges, their assessment and structural analysis. He is a reviewer for the Institution of Structural Engineers' technical exam and has experience of assessing and repairing a variety of bridges including the post-tensioned concrete spans over the River Exe.

Mark Scrivener

Principal Engineer

CEng, MICE

17 years experience

One of Tony Gee's leading temporary works engineers, Mark led the team assessing the route for the Kinardochy scheme. He has designed the complex, award-winning temporary works for Barmouth Viaduct replacement and ensured the stability as the new trusses traversed across the historic structure. Mark works in the Esher office leading a structures team specialising in bridges.

Andy Casewell

Group Director

CEng, MICE

31 years experience

Andy has led the Esher office Structures group for over 15 years and has diverse technical experience in the design and assessment of bridges in all sectors: highways, rail, power, marine, industrial etc. He leads a talented team of highly qualified structural engineers even working on some sculptural-architectural designs.

Thomas Ashworth

Associate Director

CEng, MICE

17 years experience

Thomas is the Power & Energy lead within the Stonehouse office and for many years now has been leading work with SSE on their substation improvements and leading teams carrying out route assessments and Public Road Improvements. Thomas is also the company lead for work at the new Hinkley Point C construction, designing and checking temporary works for the main contractor.

Peter McDonald

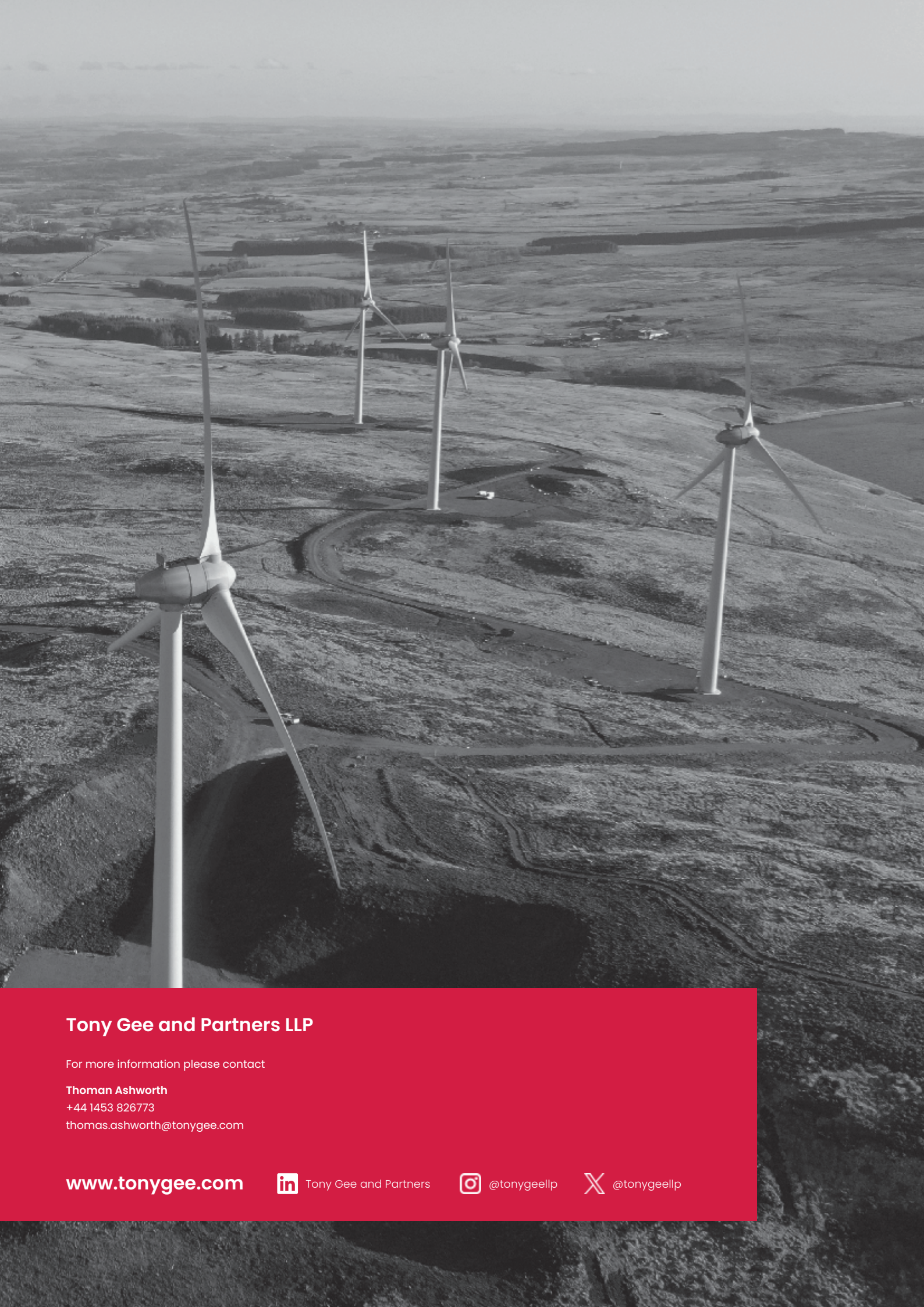
Head of Sector - Power & Energy

CEng, MIStructE

21 years experience

Peter is the company Head of Power & Energy and a member of the Institution of Structural Engineers, with extensive experience of working in the power sector and solving problems for clients bringing heavy transformers or awkward turbine blades to site. Based in the Glasgow office, he led the work on SSE's framework covering road widening and structural assessments and has worked with a number of hauliers.

Through our involvement in the Power and Energy Sector for over 10 years, Tony Gee has established a wide network of trusted supply chain delivery partners who offer specialist skills to compliment our in house skills to ensure the effective delivery of our projects. Tony Gee are very experienced in acting as lead consultant and happily take on the design integrator role where required to ensure all aspects of the design services are fully co-ordinated to enable the successful delivery of the project by our clients.



Tony Gee and Partners LLP

For more information please contact

Thoman Ashworth
+44 1453 826773
thomas.ashworth@tonygee.com

www.tonygee.com Tony Gee and Partners @tonygeellp @tonygeellp