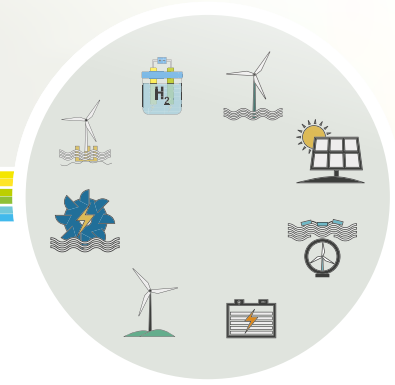




Energy Transition: Skills and Competence

Every responsible business will state that the drive for efficiency gains (cost reductions!) should never be at the expense of compromising health and safety performance.

The legal, contractual, economic and reputational implications are too great to even imply corners are being cut. However, it is becoming clearer, that as the renewable energy sector moves to the next stage of growth and maturity that there needs to be a greater focus on organisational learning and technical/safety competence if further safe and sustainable cost reductions can be maintained.

This briefing considers the essential areas the energy sector needs to consider to enhance skills and competence. It also sets out a competency assessment approach that could apply to roles involving High Voltage work.

In this briefing we set out:

- Examples of training and learning **models** that support skills and competence development
- Areas that need to be covered as part of **baseline** training for a given role
- Additional training likely to be needed for **safety critical** roles
- Importance of **Soft Skills** in developing competence
- **Competency assessment** checks necessary for HV work/roles

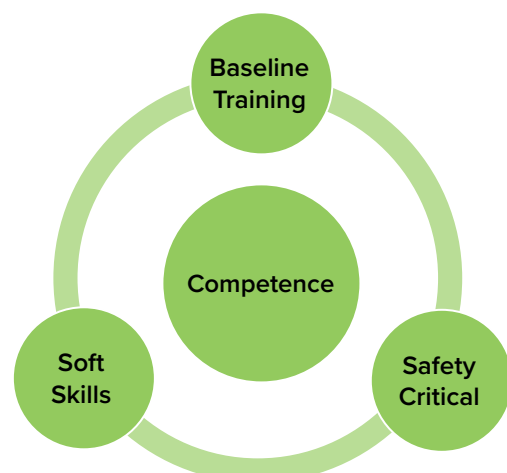
Training models

- There are numerous training/learning models, tools and approaches available. All, to varying degrees, recognise that training/qualifications, while important, are just a building block in developing competence.

Examples include:

- 70:20:10 Rule (McCall/Eichinger/Lombardo): Learning/competence comes from a range of sources
 - 70% from challenging assignments: 20% from developmental relationships: 10% from coursework and training.
- Four Stages of Competence (Sources: Various).
 - This is where individuals transition from a position of “Unconscious Incompetence” through to a state of “Unconscious Competence” where competence becomes second nature.
- Kolb’s Learning Cycle: Where reflection is an essential part of the learning process and facilitated by learning activities.
 - Concrete Experience: Reflective Observation: Abstract Conceptualisation: Active Experimentation
 - Good learning and development processes (individual and company) recognise these principles in order to develop a range of capabilities to ensure competence standards are met and continue to be maintained and updated.

Key areas where there are significant opportunities to enhance safety standards, but also improve the wider sector capability in managing risk include improved “**baseline training**”; a greater focus on “**safety critical**” roles – but also the importance of looking at “**soft skills**”.



Baseline training

Once an employer has fulfilled their duty to eliminate risks so far as is reasonably practicable, they are required to provide such information, instruction, training and supervision as is necessary to address the residual risks. A person can be considered competent if they have suitable and sufficient:

- Understanding of the risks and safe systems of work that are relevant to the location where they are working
- Knowledge of the specific tasks to be undertaken, and the risks that they entail
- Training, experience and ability to undertake their assigned duties, and sufficient understanding to recognise their own limitations.

Industry training standards (e.g., GWO BTT/COHE; WTSR¹) provide a good baseline – but alone will not demonstrate an individual is “competent”². Many companies build on this training to ensure employees and contractors are competent. However, the move to more outsourcing of technicians and related roles increases the risk that the verification of essential safety competencies could fall through the cracks. To reduce this risk the industry needs to ensure employees/contractors are provided with:

- Suitable task/role specific induction and training - especially at a project/site level
- Regular briefings and updates on new, live or dynamic risks
- Regular “hands on” refresher training to minimise the risk of skills fade.

Safety critical roles

It is understandable why training often focuses on technicians and frontline employees - however experience in managing risks in complex environments makes clear that developing the competence of individuals working in potentially safety critical roles is essential.

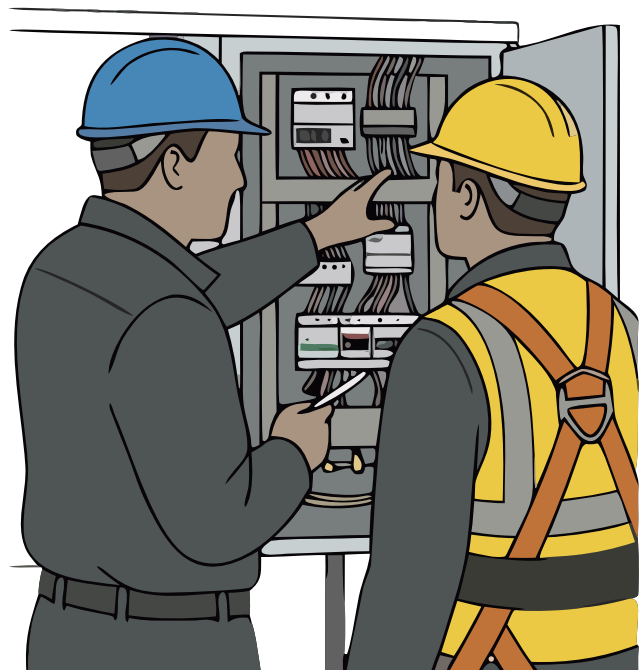
The risks of some roles are obvious (e.g., HV Safety) – but in many cases the safety risks and consequences that could follow a “bad decision” are less clear. While there is no accepted “right” approach - it is recommended that organisations undertake more comprehensive training

assessments that integrate the specific needs of individual roles alongside the wider risk management processes carried out³. Examples of roles and activities that could be deemed “safety critical” in the wind/renewables sector include:

- **Hazard/Activity:** e.g., HV/SAP's, WTSSR⁴ Level 2 AT/AE, confined spaces, first responders, lifting supervisors, cable jointers, technical & safety trainers etc.
- **Support Roles:** e.g., Marine coordinators, client reps, H&S advisers, designers, inspectors (statutory), site/project managers, operational controllers, logistics etc.

These are indicative only. The main point is to identify potentially safety critical roles, understand the consequences of failure and then develop a risk-based plan that addresses any technical and safety competence gaps.

An example of the selection & competence assessment criteria that could apply to the HV roles/work is set out below. This makes clear the checks and processes are more than just a “tick box” paper exercise.



¹ Basic Technical Training (BTT); Control of Hazardous Energies (CoHE); Wind Turbine Safety Rules (WTSR)

² E.g., Electrical & Mechanical knowledge and understanding of the principles of Safety from the System

³ E.g., Company/Project/Asset/Task

⁴ Wind Turbine System Safety Rules – incorporates Turbine HV equipment

Soft skills

We are seeing the emergence of a wider range of delivery & assessment options (e.g., role play, exercises, interactive, e-learning etc.), though health and safety training is still dominated by tutor led classroom & online (e.g. Teams) instruction. The training above is calling out for innovation to make it more engaging and relevant. Even if this is improved – its value will be limited unless we also invest in the “soft skills” to support the role and individual and how this aligns to the wider H&S Culture.

This is a vast area with extensive academic and educational theory to support those interested. Examples of soft skills that are relevant include:

- Personal Skills e.g.
 - Communications
 - Coaching/mentoring
 - Decision making
 - Teamwork
 - Problem solving
 - Etc.
- Safety Behaviours e.g.
 - Attitudes
 - Aptitude
 - Confidence
 - Beliefs
 - Values
 - Etc.
- Self-Resilience e.g.
 - Situational awareness
 - Interpersonal skills
 - Self-awareness
 - Mindfulness
 - Personal safety
 - Etc.



Our key message is, if you want the best person most suited to the role, it is important to consider the soft skills that can enhance the safety of the project, but above all protect the individual and their colleagues.

Training should never become a tick box system – it should be treated as an investment. Box 1 provides some suggested tips to really enhance value and learning.

Box 1: Top 10 Training Tips

1. Investment: Always treat training as an investment that will add value to the business – not as a compliance cost or overhead.
2. Risk Based: The selection of the type and frequency of training should be risk based and role specific and take account of both safety and business needs.
3. Hands on: Regular and hands on practical training (e.g., using the actual equipment used on site) is essential to support formal training carried out.
4. Use technology: Look at the opportunity to invest in new technologies such as virtual reality and simulators to make the training more realistic.
5. Relevant: Make the training and content interesting – use real case studies relevant to the audience – and make sure it is accurate and up to date.
6. Know your trainer: Don't just select the training provider – but ask about the experience of the actual trainer(s).
7. Participation: Actively involve workers in the design and delivery of the training – encourage them to also get involved in the delivery of refresher training.
8. Measure outputs: Measure knowledge, skills and understanding before and after the training but also later to confirm knowledge retention and any evidence of skill fade.
9. Skill fade: Acknowledge this will happen, so make sure this can be minimised by ensuring there is regular refresher or top up training especially for safety critical skills.
10. Be positive: Too much health & safety training is fixated on the consequence of getting things wrong. Good training will emphasise the H&S benefits not just for the company – but also the individual.

HV Roles

This summary provides an indicative overview of the key selection & competence assessment criteria for a HV Roles. It is not intended as prescriptive or to set out any specific approach to apply. [See also disclaimer].

Definitions

Senior Authorised Person (SAP)

There are no explicit legal definitions of an SAP. SAP is a term defined in many Electrical Safety Rules that came out of the Central Electricity Generating Board (CEGB) in one example the definition⁵ is:

Senior Authorised Person - An Authorised Person appointed by an appropriate officer of the Company to carry out duties specified in writing, including the preparation, issue, transfer and cancellation of specified Safety Documents.

[This definition refers back to that of an Authorised Person and Safety Documents in this example would refer to Permit to Work and other specified safety documents (e.g. Local Management Instructions) under the particular safety rules.]

Authorised Person - A Person who has been appointed by an appropriate officer of the Company to carry out additional procedures specified in writing e.g. HV switching duties.

Level Two Authorised Persons [Wind Turbine]

The Wind Turbine System Safety Rules include two roles encompassing HV responsibilities. The Level two authorised technician & the Level two authorising engineer.

- Level two authorised technician
 - A level two authorised technician who has sufficient technical knowledge and/or experience of plant and apparatus to enable them to avoid danger and who has been appointed by the authorisation officer of [Company A] to be responsible for
 - Enacting the process of transfer of control, in circumstances defined in these safety rules and/or management instructions.
 - Achieving general safety prior to the commencement of work or testing and

maintaining those conditions for the duration of the work or testing.

- Implementing and confirming safety precautions during the work or testing in compliance with an HV approved written procedures.
- Setting working parties to work and supervising certain associated safety rules procedures.
- The transfer, clearance and cancellation of HV approved written procedures.
- Level two authorising engineer
 - A level one authorising engineer who has sufficient technical knowledge and/or experience of plant and apparatus to enable them to avoid danger and who has been appointed by the authorisation officer of [Company A] to carry out duties specified in writing, including the approval of HV approved written procedures



Legislation

The requirements for duty holders and in particular employers are to ensure the appointment of competent persons and that employees are adequately informed, instructed and trained. These duties are set out in the legislation summarised below.

The main legislation relevant to the selection and appointment of SAPs in the UK includes, but is not necessarily limited to the:

- **Health and Safety at Work etc. Act 1974**
 - Places duties on employers to ensure the safety of employees and others so far as reasonably practicable including the duty to provide information, instruction and training to employees
- **Management of Health and Safety at Work Regulations 1999**
 - Duty to carry out suitable and sufficient risk assessments and covers the appointment of competent persons and the provision of suitable information and training including repeated and refresher training
- **Electricity at Work Regulations 1989**
 - Requires that electrical equipment for use at

⁵ The ENA provide a definition of various roles including the SAP "An Authorised Person who has been appointed in writing by the Electricity Company to carry out specified duties, including the issue and cancellation of Safety Documents". SHE Standard 07 Model Distribution Safety Rules

work to be constructed, maintained and operated in such a way as to prevent danger, so far as is reasonably practicable. Includes explicit duty to ensure that “No person shall be engaged in any work activity where technical knowledge or experience is necessary to prevent danger or, where appropriate, injury, unless he possesses such knowledge or experience, or is under such degree of supervision as may be appropriate having regard to the nature of the work”

- **Provision and Use of Work Equipment Regulations 1998**

- Every employer shall ensure that any employee who supervises or manages the use of work equipment has received adequate training for purposes of health and safety

- **Construction (Design and Management) Regulations 2015**

- Applies to all construction projects, whether onshore or offshore. Defines a number of key duty holders within a project (Client, Principal Designer(s), Designer(s), Principal Contractor and Contractors.) Explicit duty to only appoint or engage people and organisations with the appropriate skills, knowledge, experience and (if an organisation), the organisational capability to manage health and safety risk.

This briefing does not consider the relevant HSE approved codes of practice or guidance⁶ that may apply or the variety of other information sources including relevant industry guidance or standards⁷ applicable. Duty holders and appointed competent persons will need to consider these in understanding the relevant legal and technical safety requirements relevant to the appointment of anyone undertaking HV work.

Integration into Safety Management System

The continued growth of the renewable energy sector and the increased electrification of our energy system⁸ is likely to create a high demand for individual with HV experience. This will in turn place an increased responsibility on duty holders to ensure that robust processes are put in place to ensure that only suitable trained and experienced (competent) individuals are appointed.

Each organisation should develop its own approach and systems that are suitable and proportionate to its particular situation. Smaller sites and projects with fewer and less complex interfaces will not normally require as sophisticated or comprehensive systems more typically expected for larger sites with numerous commercial, operational and system interfaces. However, in every case high standards of safety integrity and assurance must always be achieved, irrespective of size or complexity issues.

To enable the issues to be properly integrated into the relevant safety management systems duty holders are recommended to consider:

- **Safety Rules:** That a designated person (typically the employer) has identified/agreed and implemented an agreed set of system rules (LV/HV) which the person undertaking HV work will need to follow and be authorised under
- **Needs Analysis:** That prior to the selection process, suitable training need analysis has been performed to determine the specific HV competence criteria required
- **Risk Assessment:** How suitable and sufficient risk assessments will be carried out that address project, site and technology specific risks for which any staff working under the system rules including those undertaking HV work will need to be aware of and follow as applicable
- **Authorisation:** How electrical safety generally and the selection and assessment of authorised persons including those performing HV work will be referenced in the applicable health & safety policies, arrangements and management systems⁹

It is also recommended that anyone else involved in the selection process is properly informed (e.g., HR, recruitment agencies etc.) about the agreed selection and competence criteria for anyone carrying out HV work.

Whatever the contractual status of an appointed HV Role is, they must never act in isolation. Whether directly employed, contracted in or self-employed, individuals must be considered an integral part of the project team throughout the lifecycle of a project. They play a vital role in ensuring everyone working on the electrical system is safe. To achieve this anyone undertaking HV Roles need to be fully supported and adequately resourced to fulfil their role.



⁶ E.g., Health & Safety Executive

⁷ E.g., CEN, CENELEC, ISO, IEC, IECRE, BSI

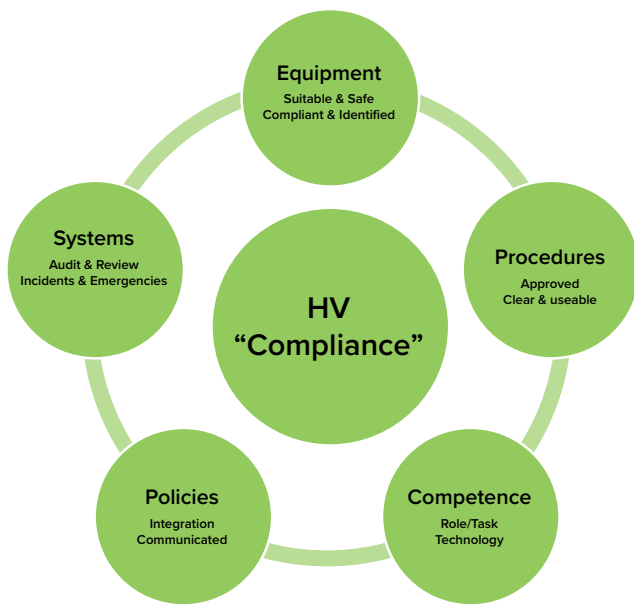
⁸ Numerous examples in addition to wind including Solar, Battery Storage; Grid / Distribution (HV-DC). In addition, there is likely to be more co-location of Generating Storage and Distribution assets.

⁹ E.g., Health & Safety at Work etc. 1974; Management of Health & Safety at Work Regulation 1999; BS EN 45001:2018 etc.

Role & status of HV Roles

Anyone designated to undertake HV work must be authorised for that role based on a formal assessment of their electrical and mechanical Electrical & Mechanical competence. The assessment will be based on their training, knowledge and experience. Designations do not automatically transfer between employers or projects. This is because the criteria for determining and assessing competence is specific to the:

- Individual role and responsibilities for that organisation
- Particular risks and requirements of the project and work being undertaken
- Nature and type of assets involved (e.g., voltages; switchgear, transformer, powerlines; substations etc.



Selection & Assessment

As there is no legally mandated approach for the selection and assessment of persons undertaking HV work, each duty holder will need to determine their selection and competence criteria to meet its specific requirements and risk profile. Many organisations have based their approach on the protocols developed over several decades experience gained from primary energy generation, grid and distribution network operations. These provide a helpful benchmark but in themselves may not in every case be adequate to address the specific technical and operational circumstances applicable to a renewable energy project¹⁰.

In determining the initial and continued competence for appointed HV roles, consideration would typically include, but not necessarily be limited to, evidence and systems that take account of the following:

- **Qualifications:** Suitable electrical qualification(s) and experience in electrical power engineering"
- **Knowledge:** Relevant technical knowledge covering but not limited to:
 - Adequate knowledge of electricity & inherent dangers of the system(s)
 - Adequate experience of electricity & inherent dangers of the system(s)
 - Adequate understanding of the system to be worked on and practical experience of that class of system
 - Understanding of the hazards which may arise during the work and the precautions which need to be taken
 - Ability to recognise at all times whether it is safe for work to continue
 - Practical demonstration of knowledge applied to specified equipment/systems
- **Experience:** Relevant experience as an AP/SAP and in operating to relevant safety rules and systems including:
 - Voltage of systems worked on previously
 - Type of work carried out – construction / commissioning / maintenance / repair / upgrade
 - Type of asset worked on – substation / turbine / overhead/underground line / cable
 - Tests carried out
 - Switchgear type/design operated
 - Transformer type/design operated
 - Protection relay experience
- **Personal Qualities¹²:** The could include:
 - Commitment to put health and safety above all else
 - Not willing to be negatively influenced by management time or economic pressures
 - High commitment to follow written procedures thoroughly
 - Good written and oral communication skills
 - Commitment to problem solving in a cooperative manner
 - Accuracy & thoroughness e.g. Documentation completed clearly and adequately
 - Confidence and right attitude to instigate a "Stop Work Authority"
- **Refreshers:** A programme of regular and formal refresher training undertaken and delivered by a competent individual and/or organisation

¹⁰. Most UK renewable energy projects will be using authorising panels. However their scope, format and terms of reference may not always be recognising the requirements and responsibilities expected based of historic precedents

¹¹. E. g Relevant electrical qualifications (e.g.. HNC/HND/NVQ/SVQ etc.) (Typically, at Levels 4/5). Higher qualifications may also be desirable.

¹². See also some of the soft skills above

- **System Rules:** Understanding and access to the safety rules for which he/she is to be authorised including the boundary points and control arrangements
- **Project Updates:** Access to updates and new information relevant to the project/site/technology and in particular any amendments or changes to agreed rules/systems (e.g., use of electronic permits)
- **Technical Updates:** Access to updates in changes in standards and legislation specific to the location and jurisdiction of the project
- **Incident Reports:** Access to the relevant incident reporting schemes including ENA NEDERS¹³ ; Dangerous Incident Notifications (DIN's); Suspensions of Operating Practice (SOPs); Industry Incident schemes (e.g., G+/SafetyOn/Energy Institute)
- **Site familiarisation:** Suitable induction and refresher training to ensure the individual receives necessary familiarisation training on the equipment specific to the project
- **Sector training:** Processes to ensure suitably qualified individuals who have no, or limited experience of renewable energy projects are provided with additional training to bring their competence up to an agreed level
- **Assessment & Authorisation:** Processes to ensure the individual is formally assessed, authorised and appointed to the project role
- **Limitations:** Details of any limitations for the assessed role including how verified (e.g. "under supervision")
- **Audits:** Proactive audits and equivalent reviews need to be carried out to ensure the competence "compliance cycle" is being maintained. Audits should not be restricted to just reactive investigations after an incident/near miss

All of the above would normally need to be recorded and supported by written procedures specifying the roles and responsibilities of the individual concerned and any specific limits of their authorisation.

It is acknowledged that not every employer will have the necessary experience or confidence to carry out all of these requirements. In such situations it is reasonable to appoint suitable experienced and competent consultants or other 3rd parties to assist in the process.

It should be emphasised that additional checks may need to be made when appointing SAP's who are self-employed or where they have limited or no experience of operating within the UK. The latter is particularly important in view of the differing approaches and standards that are operated across different countries¹⁴.

¹³. National Equipment Defect Reporting Scheme (<http://www.ena-eng.org/NEDeRS/>) [Password access needed]

¹⁴. A good standard of written and spoken language is also (e.g., English) is deemed essential

Summary

The importance of appointing experienced and competent HV workers is self-evident not least because of the critical role they play in ensuring the highest standard of electrical safety throughout the life of a renewable energy project.

Each duty holder needs to review its position taking account its own situation and the particular risks of that project or activity. However, in taking account the issues set out above, consideration would normally need to take account of the following when ensuring the appointment and continued suitability and competence for all HV roles.

1

Rules: That there are clear, agreed and robust system rules (LV/HV) in place that set out the essential safety protocols applicable to the project

2

Compliance: That all rules and systems are verified as being compliant to relevant legislative and applicable standards

3

Selection: There is a formal written selection procedure including defined and agreed competence criteria against which this will be performed

4

Panel: The quality and experience of the selection/authorisation panel needs to be considered. It is good practice that the competence of panel members is also “tested”

5

Experience: That the appointed HV worker either has relevant renewable energy and technology specific experience and/or there are measures in place to address any gaps in knowledge or experience

6

Skills: Individuals have complementary soft skills and the right attitude and safety behaviours that enhances the local safety culture

7

Communications: There is proper communication of the relevant policies and procedures to ensure all relevant internal and external parties are aware of the criteria applicable

8

Audit: That there are systems and procedures to audit, revise, review and update the issues above where applicable. This may need to cover various project stages including design, construction, commissioning and operations & maintenance¹⁵.

¹⁵. Depending on the role/project requirements, may also need to include Factory & Site Acceptance Testing (FAT/SAT)

Contacts and Links

Note: These are mainly UK focused. Equivalents are likely to exist in other jurisdictions

British Electrotechnical and Allied Manufacturers Association (BEAMA)
<http://www.beama.org.uk>

British Standards Institute (BSI)
<https://www.bsigroup.com>

Energy Institute
<https://www.energyinst.org/technical/wind-operational-safety-rules>

Energy Network Association (ENA)
<https://www.energynetworks.org>

Health and Safety Executive (HSE)
<http://www.hse.gov.uk>

G+ Offshore Wind H&S Association
www.gplusoffshorewind.com

Global Wind Organisation
<https://www.globalwindsafety.org>

International Electrotechnical Commission (IEC)
<http://www.iec.ch>

The Institution of Engineering and Technology (IET)
<http://www.theiet.org>

SafetyOn
<https://safetyon.com>

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