Competence of Persons controlling, operating and working on HV Apparatus

Issues Paper

By:
Engineers Ireland Electrical Division Working Group

May 2022

Contents

1. Introduction

Significant electricity infrastructure developments are required to meet future societal needs in Ireland. High demand growth, network transformation and decarbonisation are drivers widely recognised by energy sector stakeholders such as the Commission for Regulation of Utilities (CRU), the Irish Transmission System Operator EirGrid, electricity System Operator for Northern Ireland (SONI) and the Electricity Supply Board (ESB). Ireland's clean energy transition with ambitions to achieve 70% renewable energy by 2030 in line with Governmental targets set out in the Climate Action Plan[1], will require substantial investment across the energy value chain.

The rapid expansion of electricity generation, transmission, distribution and demand infrastructure will require a considerable increase in the number and diversity of organisations and persons working with electricity and in particular High Voltage (HV) electricity. In the absence of clear guidance from a centralised body with responsibility for setting standards for organisations wishing to **authorise persons and companies to manage and operate HV installations** and to **plan, organise and carry out work on or near HV plant and equipment**, there is a potential deficit in knowledge and guidance regarding the process which should be followed.

It would seem inevitable that some organisations may seek the opinion of a Chartered Electrical Engineer for guidance.

Engineers Ireland Electrical Division Committee established a working group in late 2019 to research this area with the objective of identifying issues, highlighting potential risks to Irish energy sector relevant authorities and to generally raise Engineers Ireland member awareness and knowledge on the subject.

Further information relating to the group members can be found in Appendix 1 – Working Group Member Biographies.

2. Purpose

The objectives of this paper are to:

a) Identify issues which require attention (section 4)

b) Suggest actions in regard to addressing the issues identified (section 5)

c) Summarise findings of the research into the area (section 7)

The methodology used is described in section 6.

[1] Climate Action Plan 2021 (www.gov.ie)

3. Background

3.1. Legislation, Regulations and Standards

Duties and guidance in relation to competence of persons, controlling, operating and working on HV Apparatus is provided in:

- Safety, Health & Welfare at Work Act 2005. (SHAWW 2005)
- Safety, Health & Welfare at Work (General Applications) Regulations 2007 to 2016 [2] (referred to as SHAWW GAR throughout this document)
- Energy (Miscellaneous Provisions) Act 2006[3]
- I.S. EN 50110-1 OPERATION OF ELECTRICAL INSTALLATIONS - PART 1: GENERAL REQUIREMENTS[4] (referred to as I.S. EN 50110 throughout this document)

3.2. Duties of Electrical Installation Owners

SHAWW Regulation 76 Suitability of electrical equipment and installations requires that: *"An employer shall ensure that—*

(a) all electrical equipment and electrical installations are—

(i) designed,

(ii) constructed,

(iii) installed,

(iv) maintained,

(v) protected, and

(vi) used

so as to prevent danger"

EN 50110 is a European Standard developed by CENELEC to provide a framework and guidance in relation to management and operation of electrical installations and so create a common level of safety within Europe.

While EN 50110 is now adopted as Irish Standard I.S. EN 50110 it is not referenced in SHAWW legislation or regulations.

[2] Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007) as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (S.I. No. 732 of 2007)
[3] https://www.irishstatutebook.ie/eli/2006/act/40/enacted/en/html
[4] I.S. EN 50110-1:2013 OPERATION OF ELECTRICAL INSTALLATIONS - PART (standards.ie)

Best Practice in Europe as described in Appendix 4, is that EN 50110 is referenced in national legislation as a minimum standard to be observed and if this best practice is followed in Ireland, such that electrical installations including HV installations are managed and operated in accordance with I.S. EN 50110, it should provide strong evidence that the installation owner (Employer) has complied with SHAWW GAR 76 (a) (vi).

In regard to the competence of persons, it is again generally accepted as best practice within Europe, that compliance with EN 50110 is fundamental to providing the necessary framework and environment in which persons can be assessed and authorised as being competent to work on or near electrical installations including High Voltage (HV) installations.

3.3. Roles and Responsibilities

The principal roles for which persons should be authorised as having appropriate competence are defined in I.S. EN 50110-1 as:

3.2.1 person responsible for an electrical installation

nominated person with the overall responsibility to ensure the safe operation of the electrical installation by setting rules and organisation or framework

3.2.2 nominated person in control of an electrical installation during work activities

person who is responsible during work activities for the safe operation of the electrical installation

3.2.3 nominated person in control of a work activity

person nominated with the ultimate responsibility for the work activity at work location

3.2.4 skilled person (electrically)

person with relevant education, knowledge and experience to enable him or her to analyse risks and to avoid hazards which electricity could create

3.4. Competence Requirements

I.S. EN 50110 requires that allocation of responsibility and determination of appropriate levels of competence should be in accordance with national legislation but where there are no national requirements for competence, the following criteria are specified to be used in assessing the competence of persons:

– knowledge of electricity
– experience of electrical work
– understanding of the installation to be worked on and practical experience of that work
– understanding the hazards which can arise during the work and the precautions to be observed
– ability to recognise at all times whether it is safe to continue working

Regulation 88: Persons to be competent to prevent danger (SHAWW GAR) requires that: "*An employer shall ensure that no person is engaged in any work activity to which this Part relates where technical knowledge and experience is necessary to prevent danger unless that person is competent or is under such degree of supervision as is appropriate, having regard to the nature of the work*".

The Health and Safety Authority (HSA) Guide to the SHAWW Regulations[5] states that:

"*For the duration of the work, control must be under a person who possesses sufficient technical knowledge and experience, or be supervised, so as to ensure that danger is prevented. Technical knowledge and experience includes:*

- *Adequate knowledge of electricity*
- *Adequate experience of electrical work*
- *Adequate understanding of the installation type to be worked on and practical experience of that class of installation*
- *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*"

I.S. EN 50110 is therefore more onerous, insofar as it requires "adequate understanding of the" particular "installation to be worked on and practical experience of that work" rather than "adequate understanding of the installation type to be worked on and practical experience of that class of installation", but when the SHAWW act duties (including 81 Onus of Proof) are considered, it would seem reasonable to conclude that for complex HV installations, the requirements of I.S. EN 50110 should be applied where reasonably practicable.

[5] Guide to the Safety, Health and Welfare at Work Part 3: Electricity (HSA)

4. Issues Identified

The principal issues identified and requiring urgent attention are outlined in this section.

4.1. Non-compliance with SHAWW General Application Regulation 76 (a) (vi)

As discussed in section 6.3, from the survey results there appears to be a general deficit in awareness in regard to best practice for safe management and operation of electrical installations including compliance with I.S. EN 50110.

Industry insights also support this finding and it is therefore reasonable to conclude that many electrical installations and in particular HV installations in Ireland, are not being managed in compliance with I.S. EN 50110 and SHAWW GAR. It follows, that in such cases, the necessary framework and environment is not being provided in which persons can be assessed and authorised as being competent to work on or near HV installations and these installation owners (Employers) may not be considered to be taking all reasonably practicable measures to prevent danger.

4.2. Non-compliance with SHAWW General Application Regulation 88

The deficit in awareness and understanding of I.S. EN 50110 leads to the reasonable conclusion that the responsibilities and competence requirements of the various roles defined in I.S. EN 50110 are also not well understood.

It is therefore evident that there is a significant risk, that in many instances, persons nominated to manage and operate HV installations and equipment have not received adequate training and do not have the levels of competence required by I.S. EN 50110 and SHAWW GAR 88 to carry out the roles to which they have been nominated. In these situations, Employers may not have taken all reasonably practicable measures to ensure that those persons have the necessary knowledge and experience to prevent danger as is their duty under the SHAWW Act.

4.3. Regulation of High Voltage Installations, Works and Operations

The Energy (Miscellaneous Provisions) Act 2006 Part 2 section 4 9C give responsibility to Commission for Regulation of Utilities (CRU formerly CER) to "*regulate the activities of electrical contractors with respect to safety*". While there is a national regulatory scheme (Safe Electric) in place to standardise, certify and control electrical works at low voltage in accordance with I.S. 10101, which is operated by Register of Electrical Contractors of Ireland (RECI) acting as the Electrical Safety Supervisory Body (ESSB)on behalf of CRU, Ireland has no such scheme in place for high voltage installations, works and operations.

While I.S. EN 61936-1:2010 Power installations exceeding 1 kV a.c.- common rules and the associated SR 61936 -1:2019, does provide a national standard for design and construction of HV works, this

standard is also not referenced in SHAWW legislation or regulations. As with I.S. EN 50110, compliance with I.S. EN 61936 is fundamental to providing the necessary framework and environment in which persons can be assessed and authorised as being competent to work on or near HV installations.

Consequently, Ireland is not following best practice in regard to certification of HV works and regulation of HV operations.

This absence of a national regulatory scheme for HV works and operations is a significant contributor to the serious issues identified above.

It is also a cause of increased concern given the planned expansion of privately owned HV installations required to achieve the targets set out in the recently published Climate Action Plan.

5. Recommendations

In regard to the principal issues identified, the following is recommended:

5.1. Reference Standards for compliance with SHAWW GAR 76

Other than the absence of national regulation, lack of awareness and information in regard to the applicable standards and best practice would appear to be the main contributory factor.

It is recommended therefore, that Engineers Ireland as the voice of the professions, engage with HSA and CRU to advise that I.S. EN 50110 and I.S. EN 61936 be referenced in Irish legislation and regulations as the minimum standard to be respected so as to ensure that danger is prevented and so bring Ireland into line with European best practice.

While Engineers Ireland can provide advice and support, it is assumed that HSA and/or CRU where appropriate would take ownership of making the necessary amendments to legislation, regulations and guidance material.

It is also recommended, that Engineers Ireland inform it's members at the earliest opportunity in relation to their obligations to meet best practice in the area of management and operation of HV installations and to advise it's members in regard to sourcing the necessary knowledge and training.

5.2. Reference Standard for compliance with SHAWW GAR 88

Other than the absence of national regulation, lack of awareness and information in regard to the applicable standards and best practice would appear to be the main contributory factor.

It is recommended therefore, that Engineers Ireland as the voice of the professions, engage with HSA and CRU to advise that I.S. EN 50110 be referenced in Irish legislation and regulations as the minimum standard to be respected in regard to competence requirements to work on or near HV installations and so bring Ireland into line with European best practice.

While Engineers Ireland can provide advice and support, it is assumed that CRU and/or HSA would take ownership of making the necessary amendments to legislation, regulations and guidance material.

It is also recommend, that Engineers Ireland inform its members at the earliest opportunity in relation to their obligations to meet best practice in assessment of competence of persons nominated to manage and operate HV installations and to advise it's members in regard to sourcing the necessary knowledge and training.

In this regard, the approach described in 7.2 below could form the basis of a guidance paper for Engineers Ireland members.

5.3. National regulatory scheme for HV Installations, Works and Operations

There is an urgent requirement for a national regulatory scheme to standardise, certify and control electrical works and operations at high voltage to complement the existing regime at low voltage.

Given the issues identified and the increased concern in regard to the planned expansion of privately owned HV installations, it is recommended that Engineers Ireland as the voice of the professions communicate these concerns to HSA and CRU at the earliest opportunity and advise that a regulatory scheme be set up in accordance with I.S. EN 61936 SR 61936 and I.S. EN 50110 to include installations, installation owners and contractors as appropriate, so as to ensure that danger is prevented and so bring Ireland into line with European best practice.

While Engineers Ireland can provide advice and support, it is assumed that CRU and/or HSA would take ownership of putting this regulatory scheme in place.

6. Methodology

The working group initially considered their collective industry knowledge and experience to set out the terms of reference for the work. A review of key standards was carried out and anecdotal evidence considered. The working group also sought advice from CENELEC colleagues in relation to best practice in other CENELEC countries. Finally, to formally ascertain views from the wider Electrical Division and energy sector a questionnaire and survey were developed.

6.1. Questionnaire

A questionnaire was developed and circulated to 82 individuals in the following sectors:

i. ESB Networks
ii. Wind Energy Ireland
iii. Datacentre
iv. Industry
v. National Standards Authority of Ireland (NSAI) Electrotechnical Committee (ETC) Technical Committee (TC) 03 Power Installations Exceeding 1 kV a.c. (1.5 kV d.c.)[6]

The focus of the Questionnaire which is included as appendix 8.1 was to record:

a) levels of Authorisation including those defined in I.S. EN 50110
b) minimum requirements for education, training and experience applicable to each Authorisation Level
c) the format of the competence assessment process
d) competence requirements for the person responsible for carrying out the assessment and issuing Authorisations (Authorising Engineer)
e) audit template (if any) in use for the assessment and verification of organisations, responsible for and engaged in, Assessment of Competence and issuing Authorisations for Competent Persons

A very limited response was received but some very useful information was obtained and discussed with a small number of respondents from a few organisations.

The findings are presented in 6.3.1.

6.2. Survey

A survey was developed with Survey Monkey[7] which was circulated to over 2,600 subscribers of the Electrical and Electronic Division[8].

[6] TC Annual Report Template (nsai.ie)
[7] Survey Monkey
[8] In 2020 the Electrical and Electronic Division was restructured to form the two Divisions, the Electrical Division and the Electronic and Computing Division

The survey questions focused on:

a) Compliance with I.S. EN 50110
b) Competence Requirements for Nominated Persons
c) Assessment of Competence for persons and companies
d) Opinion of EI members

The survey was completed and returned by 134 Engineers Ireland members and 9 non-members making 143 in total.

The findings from the survey are given in 7.1.

6.3. Analysis of Information

6.3.1. Questionnaire

The information received in response to the questionnaire was discussed with a limited number of respondents and compared with the survey responses and other anecdotal evidence.

6.3.2. Survey

The information received in response to the survey was analysed and grouped in regard to:

a) Compliance with I.S. EN 50110
b) Competence Requirements for Nominated Persons
c) Assessment of Competence for persons and companies
d) Opinion of EI members

7. Review Findings

7.1. Survey Results

The survey results as received from Survey Monkey are presented in Appendix 3 – Survey Results.

The percentages provided by Survey Monkey are calculated on the number of answers to each question (omitting the number who skipped the question) rather than the number of respondents. In some cases, percentages are calculated on the number of respondents [143] where it was deemed to be more meaningful and shown as [x%]. Text in italics are actual responses from respondents and have not been edited. Text in bold italics are extracts from the standards.

This section analyses the high-level data from Survey Monkey and is summarised as follows:

The **organisations** where the respondents are working are primarily Power Utility / Independent Power Producers (IPPs) [36%], Consultant [23%], Manufacturing / Processing Plants [14%] and Contractor [13%] organisations as shown in Figure 1.

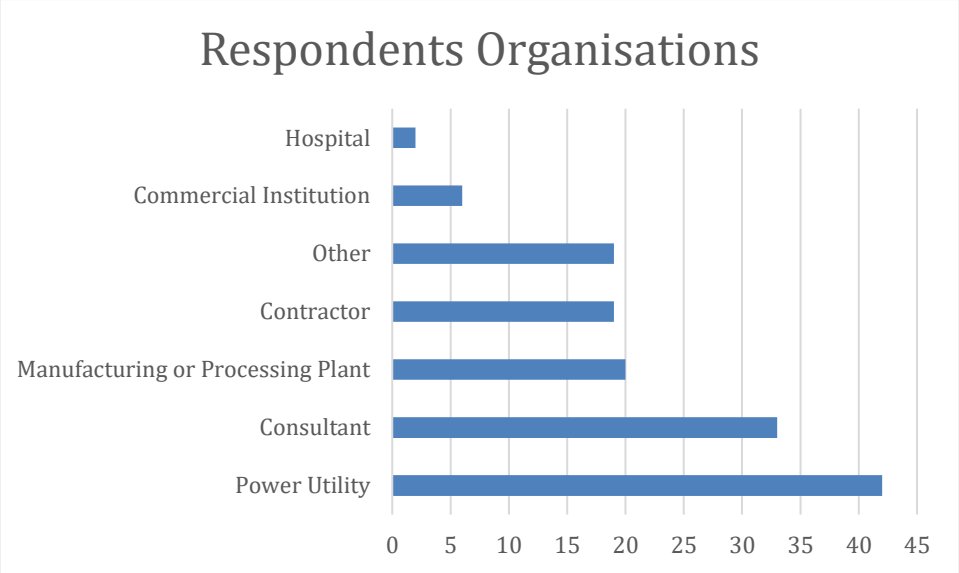


FIGURE 1: RESPONDENTS ORGANISATIONS AS PER THE ASSESSMENT OF COMPETENCE SURVEY

Of the 143 respondents, the majority of respondents described their role as manager or engineer [both 46%] and 50 stated that they worked in the Utility sector.

The survey responses relating to the **sectors** where respondents work are shown in Figure 2.

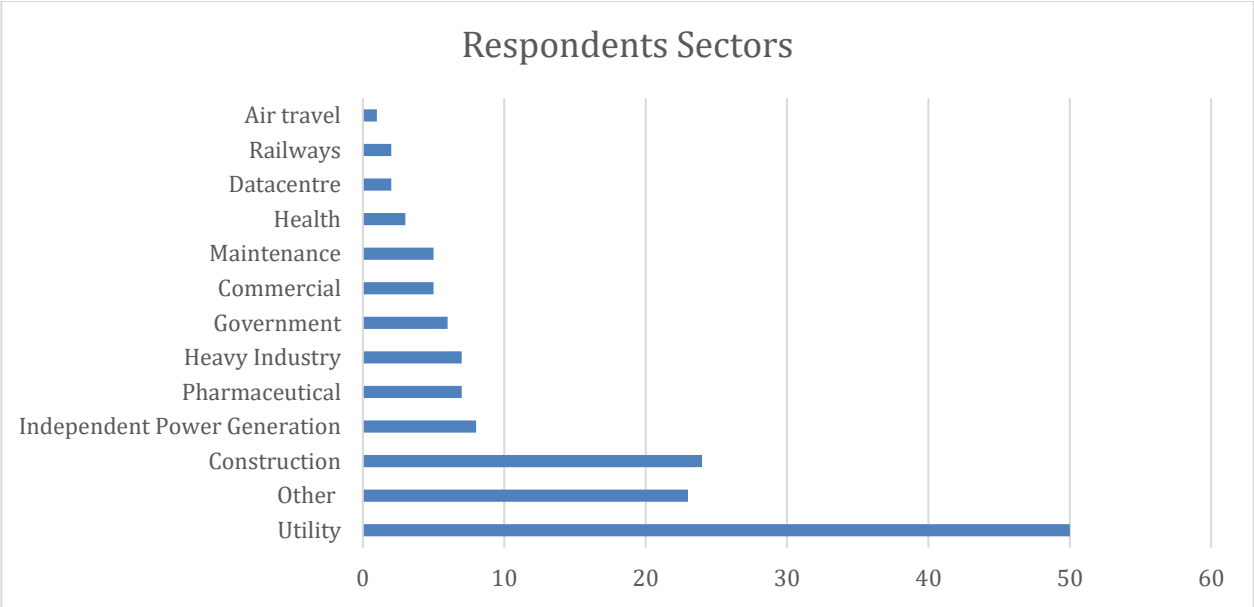


FIGURE 2: RESPONDENTS SECTORS AS PER THE ASSESSMENT OF COMPETENCE SURVEY

Findings in regard to a), b), c) and d) in 6.2 above, from the remaining questions are:

a) Compliance with I.S. EN 50110 - Operation of Electrical Installations

"minimum requirements valid for all CENELEC countries and some additional informative annexes dealing with safe working on, with, or near electrical installations"

In response to question 5, which asked respondents to state what standard their organisation managed HV installations in accordance with, 77 [54%] respondents either skipped the question or confirmed that no standard was being used, leaving 40 respondents [28%] who confirmed compliance with I.S. EN 50110 and 26 [18%] who confirmed compliance with some other standard including:

- *"Internal safety rules"*
- *"Company SOP[9]"*
- *"All applicable standards"*
- *"British Electrical Regulations"*
- *"European Medical Device Directive"*
- *"Own company HV safety rules- similar basis to EN 50110"*
- *"Internal standard not unlike I.S. EN 50110"*

In summary, only 66 respondents [46%] confirmed compliance with any standard.

Of the 40 respondents who confirmed compliance with I.S. EN 50110, 13 confirmed that they worked for a Power Utility in the Utility sector so the number of HV Installations confirmed as being managed in accordance with I.S. EN 50110 is probably less than 27.

[9] Standard Operating Procedure

I.S. EN 50110-1 clause 3.2.1 requires that a person responsible for an electrical installation is nominated with the overall responsibility to ensure the safe operation of the electrical installation by setting rules and organisation or framework. This role is commonly known as the HV System Manager and will in future be defined in I.S. EN 50110 as the Installation Manager.

In response to question 6, which asked if there is a formally nominated a person responsible for the HV installation (HV System Manager) only 56 [39%] respondents confirmed that there was a formally nominated person responsible for the HV installation (HV System Manager).

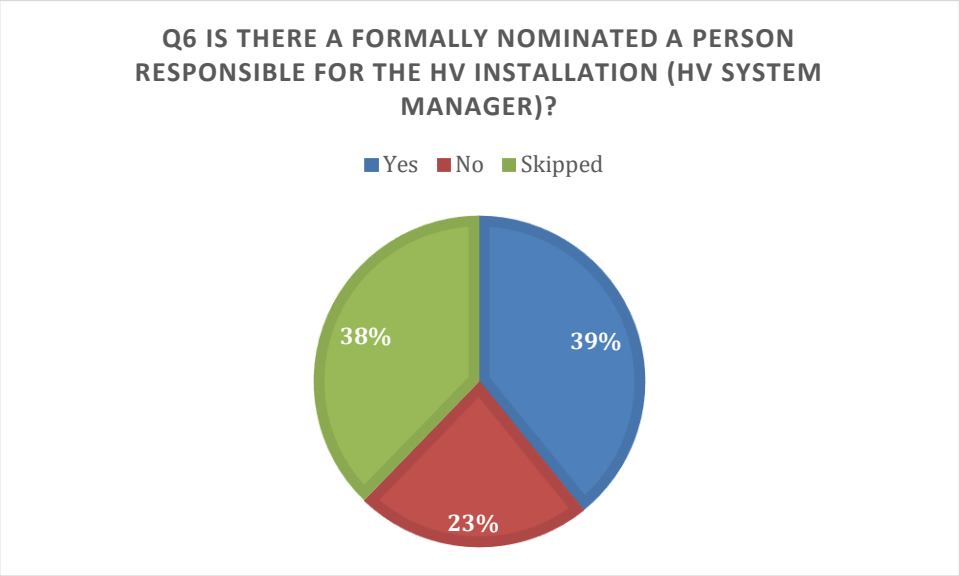


FIGURE 3: RESPONSES TO QUESTION 6 OF THE ASSESSMENT OF COMPETENCE SURVEY

I.S. EN 50110-1 clause 3.2.2 requires that there should be a nominated person in control of an electrical installation during work activities who is responsible during work activities for the safe operation of the electrical installation.

Question 10 which asked who was responsible for the control of the HV installation during work activities work activity, 65 [45%] responded that control was by a nominated person being as follows, as shown in Figure 4:

- The HV System Manager (45%)
- A specifically nominated person (Control Engineer) (32%)
- Another nominated person (23%):

"Authorised Person, Senior Authorised Person, Control Person, Commissioning Manager, HV Contractor, Facilities Manager, Construction Manager, Contractor, Plant Maintenance Manager, Competent Person, Person in Charge of Works & External".

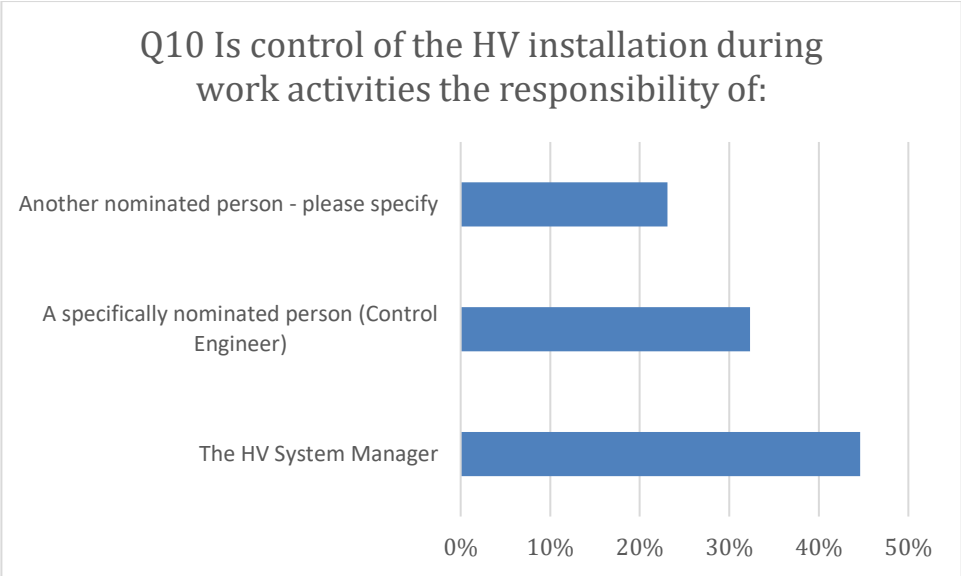


FIGURE 4: RESPONSES TO QUESTION 10 OF THE ASSESSMENT OF COMPETENCE SURVEY

I.S. EN 50110-1 clause 3.2.3 requires that there should be a nominated person in control of a work activity with *the ultimate responsibility for the work activity at work location*.

In response to question 14 which asked if there was a person nominated to be in control of the work activity, only 52 [36%] confirmed that a person was nominated to be in control of the work activity.

I.S. EN 50110-1 clause 3.2.4 requires that work be carried out by skilled persons (electrically) with *relevant education, knowledge and experience to enable him or her to analyse risks and to avoid hazards which electricity could create*

In response to question 18 on skilled persons, only 50 [35%] confirmed that work was carried out by skilled persons who are authorised to carry out specific tasks (Authorised Persons).

While it should be noted that I.S. EN 50110 allows roles to be combined, the responses still demonstrate a low level of confirmed compliance and a significant lack of awareness regarding how the installation should be managed and controlled during work activity so as to prevent danger.

While this does not directly indicate that electrical installations are not being managed in compliance with appropriate standards, the low level of confirmed compliance and awareness of applicable standards does highlight the potential risk of non-compliance.

b) Competence Requirements for Nominated Persons

The survey requested information on the education, training, and experience requirements for persons nominated to carry out the four roles detailed in I.S. EN 50110 (3.2.1, 3.2.2, 3.2.3 & 3.2.4) and the role of Authorizing Engineer.

3.2.1 person responsible for an electrical installation

"nominated person with the overall responsibility to ensure the safe operation of the electrical installation by setting rules and organisation or framework"

In response to question 7, only 50 [35%] confirmed that a formal assessment of competence was carried out prior to nomination of the HV System Manager.

The 68 responses to question 8 confirmed that this formal assessment considered:

- Qualifications (79%)
- Training (86%)
- Experience (88%)
- Behavioural Competencies (44%)
- Complexity of the HV Installation (57%)

In response to question 9 on specific training, 50 [35%], confirmed that specific training was provided for the role.

These responses demonstrate a deficit in awareness, regulation and guidance in regard to how persons should be assessed, trained and nominated to this important role.

3.2.2 nominated person in control of an electrical installation during work activities

"person who is responsible during work activities for the safe operation of the electrical installation"

In response to question 11, only 53 [37%], confirmed that a formal assessment of competence was carried out prior to nomination of the person in control of an electrical installation during work activities.

The 57 responses to question 12 confirmed that this formal assessment considered:

- Qualifications (79%)
- Training (86%)
- Experience (88%)
- Behavioural Competencies (44%)
- Complexity of the HV Installation (56%)

In response to question 13 on specific training, only 50 [35%], confirmed that specific training was provided for the role.

These responses demonstrate a deficit in awareness, regulation and guidance in regard to how persons should be assessed, trained and nominated to this important role.

3.2.3 nominated person in control of a work activity

"person nominated with the ultimate responsibility for the work activity at work location"

In response to question 15, only 43 [30%] confirmed that a formal assessment of competence was carried out prior to nomination of the person in control of work activities.

The 47 responses to question 16 confirmed that this formal assessment considered:

- Qualifications (70%)
- Training in (85%)
- Experience (89%)
- Behavioural Competencies (36%)
- Complexity of the HV Installation (57%)
- Other (11%) including Presentation / Training in Company HV rules

In response to question 17 on specific training, only 43 [30%] confirmed that specific training was provided for the role which included:

- "Train the Trainer"
- "HV Switching"
- "PICW approved training course"
- "Internal managing contractors training"
- "Specific PNTC and PICW training within ESB Networks"
- "ESB Networks Training Courses"
- "ESB Training Course Portlaoise"
- "In House training"
- "Internal and external training courses".

These responses indicate a deficit in awareness, regulation and guidance in regard to how persons should be assessed, trained and nominated to this important role.

3.2.4 skilled person (electrically)

"person with relevant education, knowledge and experience to enable him or her to analyse risks and to avoid hazards which electricity could create"

In response to question 19, only 42 [29%] confirmed that a formal assessment of competence was carried out prior to nomination of the person in control of work activities.

The 46 responses to question 20 confirmed that this formal assessment considered:

- Qualifications (80%)

- Training (87%)
- Experience (83%)
- Behavioural Competencies (35%)
- Complexity of the HV Installation (61%)

In response to question 21 on specific training, only 36 [25%] confirmed that specific training was provided for the role.

These responses demonstrate a deficit in awareness, regulation and guidance in regard to how persons should be assessed, trained and nominated to carry out carry out work and have the necessary education, knowledge and experience to enable them analyse risks and to avoid hazards which electricity could create.

Authorising Engineer

(nominated person with the overall responsibility to assess competence and authorise persons or companies for roles and duties)

In response to **question 24**, only 36 [25%] confirmed that a formal assessment of competence was carried out prior to nomination of the Authorising Engineer.

The 38 responses to question 25 confirmed that this formal assessment considered:

- Qualifications (84%)
- Training (92%)
- Experience (85%)
- Behavioural Competencies (37%)
- Complexity of the HV Installation (63%)

In response to question 26 on specific training, only 31 [22%] confirmed that specific training was provided for the role.

In response to question 27 on specific qualifications, 37 [26%] answers confirmed preferred qualifications for the role as:

- Technician (19%)
- Engineer (41%)
- Chartered Engineer (32%)
- None (8%)

In response to question 27 on training, the 24 answers did not provide any particular guidance on the type of training required.

In response to question 27 on experience, the 33 answers confirmed preferred experience as:

- Under 10 years (21%)
- 10 – 20 years (34%)
- Over 20 years (36%)
- N/A (9%)

These responses demonstrate a deficit in regulation and guidance in regard to how persons should be assessed, trained and nominated to this important role.

c) Assessment of Competence for persons and companies

The survey requested information on how persons and companies were assessed in regard to their competence to carry out their roles and duties.

Competence Assessment of persons:

In response to question 22, the 46 [32%] responses confirmed that persons were assessed according to:

- Formal Internal Procedure (48%)
- Assessment by External Organisation (8%)
- National or Industry Certification (33%)
- Other (11%)

  a) "Internal assessment for Authorised Persons but external organisation for Senior Authorised Person roles"

  b) "Knowledge of individuals' experience and track record"

  c) "The Electrical Engineering Manager is the nominated HV Senior Duty Holder"

In response to question 29, the 49 [30%] answers confirmed a 69% majority in favour of national or industry regulation of person's competence over internal procedure as follows:

Total responses to question 29:

- Formal Internal Procedure (31%)
- National or Industry Certification (69%)

Utility Sector:

- Formal Internal Procedure (16%)
- National or Industry Certification (26%)

Non-Utility Sector:

- Formal Internal Procedure (8%)
- National or Industry Certification (23%)

Competence Assessment of companies:

In response to question 28, the 43 [30%] answers confirmed that persons were assessed according to:

- Formal Internal Procedure (49%)
- Assessment by External Organisation (12%)
- National or Industry Certification (23%)
- Other (16%)

In response to question 30, the 49 [30%] answers confirmed a 78% majority in favour of national or industry regulation of company's competence over internal procedure as follows:

Total responses to question 30:

- Formal Internal Procedure (22%)
- National or Industry Certification (78%)

d) Opinion of EI members

In response to questions 29 and 30, the following bodies were suggested in 11 response as appropriate to regulate competence of persons and companies:

- Engineers Ireland
- Commission for Regulation of Utilities (CRU)
- NSAI
- HSA
- Safe Electric
- Lloyds

In addition, the following general observations were received:

- "CRU has statutory obligation to nominate a supervisory body for enforcing a regime for standards AND competence. Whilst this survey is fine for eliciting opinions, some of the questions are not appropriate as the electricity Regulations and Statutory Instruments have already placed responsibility with CRU. It could be argued that CRU have not yet fully completed that role".
- "Authorising person may be someone from a Utility Electrical Trades Background with many years experience".
- "I would be in favour of improved regulation of the HV industry i.e. installation above 1000 V ac".

- "In my company, and I suspect in other consultancies also, we rely heavily on the presumed competence of contractors carrying out HV installations".
- "This survey has highlighted for me the absence of any formalised system for confirming + recording the competence of our personnel".
- "In the event of an incident occurring under our supervision, we would not be able to provide any documentary evidence of competence, training etc".
- "I also suspect that consultants would be of the view that HV safety is really the Contractor's responsibility and that they don't need to have any formal systems in place in relation to the competence and training of their own personnel".
- "It is important that any guidelines or code of practice in relation to this issue should apply equally to contractors and consultants and that an information campaign should be run to ensure that consultants are fully aware of their responsibilities".
- "This is a complex issue and I am interested in the results of your survey".
- "The Accredited body who will provide the necessary National or Industry Certification should either provide the necessary training or ensure that training is available nationally. Training should include practical exercises and be on equipment that is in use in the throughout country and not just what is used by the utilities. I would be of the opinion that any training provided at an academic level for graduates provides only a grounding. Additional training, in a working environment, is required to provide people with the confidence necessary to manage such equipment".
- "A national body, would add cost and burden with no value added on the way past. Just more paper work, just like safe pass scheme, it would become a national joke and an embarrassment".
- "As a small background of industry and persons in Ireland this would be best aligned with NI and UK bodies to establish a singular common competence criteria. Under no circumstances would it be tenable for companies to establish their own internal criteria without such alignment as would be abused by large established utilities and pressure to favour their own legacy practices and internal culture".
- "Behavioural Competence to be included in training and assessment".
- "It is well known in the industry that there is over reliance by M&E consultants on the contactor's expertise to design install and commission the MV system. Both of these organisations are closely associated with one another by way of their collaboration in the design and construction of new HV installations in the built environment. Clearly M&E consultants with responsibility for the design of MV systems should have the in house expertise to do so and should not be reliant on the contractor whose role should be to install, test and commission the system as is the case with LV installations".

- "There is a definite lack of understanding in the area of electrical design".

- "While the utility companies have long established facilities for training their own personnel, there is a strong need for formal academic training in the field of HV design and installation to prepare engineers for both consultancy and contracting areas".

7.2. General Findings and Information

The responses to the Questionnaire provided some very useful information and inferences which are discussed here.

In general respondents were positive with respect to the intent of the survey and are interested in the outcome of this initiative by Engineers Ireland. Respondents feel it is a worthwhile subject for investigation.

Several respondents would like to see the competence of persons involved in the operation of and work on or near HV systems to be regulated and by a national body as is the case in many EU countries such as Sweden where this area is regulated by the Electrical Safety Board[10].

Several respondents and/or their organisations rely on contractors to provide competent persons and there may be a "presumption" that established HV contractors are competent and will always supply competent persons.

ESB Networks engaged very proactively with the questionnaire and by way of general information, provided the following International Social Security Association document, ISSA Guidance on assessing competence to carry out roles specified in I.S. EN 50110[11] which provides some very good basic guidance and information.

ESB Networks also provided some very useful information and guidance in regard to their current thinking and internal processes in this area.

Following interviews with all the respondents to the Questionnaire the following approach would appear to be current Best Practice:

Safety-Critical Activities.

In addition to the specific roles set out in I.S. EN 50110, typical tasks and roles regarded as critical safety activities requiring specific competence include:

- Controller of the System
- Operation of the System
- Working on disconnected and earthed plant / apparatus

[10] The National Electrical Safety Board (Sweden)
[11] Guideline for Assessing the Competence (International Social Security Association)

- Working Live
- Working in the vicinity of the Live System
- Commissioning
- Metering & Cables Work
- Working at Heights
- Use of selected, non-CSCS qualified Plant & Equipment
- Persons placed in a position of charge
- Persons instructing work
- Holding keys providing access to live substation equipment
- Working on Telecoms equipment.

The process for becoming competent for these tasks may be actioned by a front-line manager who may recommend requirements for training, experience and assessment.

To become and remain competent a person must successfully complete the following processes:

Qualification Process

The qualification process is intended to provide the person with the basic knowledge required to be competent to carry out a specific task or role. In addition to basic technical qualification, the process to become competent relies on the successful completion of specific training modules typically with in-course assessment verified through an approved training centre and/or assessment by a nominated competent person sometimes referred to as an "Assessing Officer". This competent person has responsibility for assessing the suitability of qualifications and training for the specific competence qualification. In addition, this person has responsibility for making a judgement in regard to the extent to which the person to be qualified as competent has understood the training provided and ultimately deciding if the person can be qualified as competent. This assessment will generally involve an interview with the candidate.

Generally, Qualifications added after successful completion of training are formally recorded on a Qualification Certificate or similar record.

Approval Process

The approval process sometimes referred to as an **authorisation process** is intended to approve a person who has the basic qualifications and training as competent to carry out a specific task or role. The approval is typically granted by a Senior Manager with appropriate competence sometimes referred to as an "**Authorising Engineer**" who is independent from the guidance, control, or influence of, the individual under assessment or the individual's manager.

The approach utilises nominated persons with specific competencies in the assessment and review exercises, culminating in the granting of the approval (authorisation) by the senior manager.

The process generally involves a pre-assessment interview with the candidate, a period of supervision by an experienced competent person and a final assessment.

During the period of supervision, the individual completes a specific number of tasks relevant to the activity required for the approval which are recorded in a **logbook**.

The **Assessment** may include both theoretical and practical assessments as required, which are specified for each approval.

The approval when granted will be valid for a set period of time (typically 1 – 3 years) specific to the task or role.

Review Process

In order for the approval (authorisation) to remain valid the individual will be re-assessed prior to the expiry of the approval. This re-assessment may include some or all elements of the qualification and approval processes and will in addition consider the individual's activity during the period. In some instances, such as operation of equipment, the individual may be required to record all operations in a **logbook** to demonstrate that the individual has been gaining experience during the period.

The process generally involves an interview and other theoretical and practical assessments as required culminating in the re-confirmation or withdrawal of the approval (authorisation) by the senior manager.

7.3. Review of Findings

The **survey** which was circulated to over 2,600 Electrical and Electronic subscribers produced 143 responses or 5.5%.

Given that engineers in senior engineering and/or management positions could potentially be in breach of Regulation 76 of the 2007 SHAWW (General Application) Regulations, they may leave themselves open to criminal prosecution in the event of a serious electrical accident, this topic should be of relevance and importance to the electrical industry as a whole.

There is an apparent general lack of clarity in regard to how to engage on this topic and the findings from the survey indcated a significant deficit in awareness, regulation and guidance in regard to good engineering practice, in all areas covered by the survey. This is surely a cause for concern in regard to electrical safety.

In regard to compliance with **I.S. EN 50110,** only 40 respondents confirmed compliance with I.S. EN 50110, of which 13 confirmed that they worked for a Power Utility in the Utility sector.

Therefore, the number of non-Utility HV Installations confirmed as being managed in accordance with I.S. EN 50110 is probably less than 27.

This indicates that apart from the HV installations managed by EirGrid, ESB Networks and other large Utilities, some HV installations in Ireland may not be managed in compliance with SHAWW regulations and applicable standards.

The questions in regard to nomination of persons to roles defined in I.S. EN 50110 confirm this finding.

The findings regarding **Competence Requirements for Nominated Persons** again demonstrated a deficit in awareness, regulation and guidance in regard to how persons should be assessed, trained and nominated to manage control and carry out work and have the necessary education, knowledge and experience to enable them analyse risks and to avoid hazards which electricity can create.

Confirmation of compliance with good practice in this area was generally less than 30%.

The findings relating to **Assessment of Competence for persons and companies** showed a general 70/30 preference for regulation of the area by National or Industry Certification.

This is understandable given the apparent deficit in the knowledge and competence necessary for companies to carry out assessments internally.

The **Opinion of Engineers Ireland members** did not provide any particular clarity in regard to a way forward or how the topic should be managed or regulated.

However, the comments did reflect the frustration at the absence of "regulation of the HV industry" or "formalised system for confirming and recording the competence" and the over-reliance on the "presumed competence of contractors carrying out HV installations".

The expressed view that "HV safety is really the Contractor's responsibility" is directly in conflict with the SHAWW regulations and justifies the need for an "information campaign" to help all stakeholders understand their responsibilities.

In general, there were no particular findings in relation to the Utility and Non-Utility sectors.

The responses to the **questionnaire** provided some very useful information on what would appear to be current Best Practice in Ireland.

This is described in 7.2 above and could form the basis for guidance on the topic.

8. Conclusions

This review, acknowledging the small survey sample size, appears to confirm the deficit identified in the introduction and highlights potential serious issues including:

- non-compliance with SHAWW Regulation 76 Suitability of electrical equipment and installations
- non-compliance with SHAWW Regulation 88 Persons to be competent to prevent danger
- absence of a national regulatory scheme (similar to Safe Electric) for HV installations, works, operations, competence, owners and contractors
- absence of national recognition of I.S. EN 61936 (and SR 61936) as the basic design and construction standard for HV works in a similar way to the recognition given to I.S. 10101 for LV works
- absence of national recognition of I.S. EN 50110 as the minimum standard to be used in the operation and management of (HV and LV) electrical installations so as to prevent danger, ensure compliance with SHAWW GAR and comply with European best practice.

Engineers Ireland is the voice of the engineering profession in Ireland. The core purpose of the institution includes advocacy for the profession and safeguarding professional standards in the public interest. Engineers Ireland can provide a valuable service and contribution to electrical safety by taking the initiative to engage and leverage our relationships with policy makers to inform them of the issues identified and help identify solutions.

Appendices

Appendix 1 – Working Group Member Biographies

Biographies of the Working Group members are provided in this Appendix.

Padraig Plunkett:
Padraig is a Chartered Electrical Engineer with 37 years varied international experience in Power Transformers, HV Power Systems Consultancy and EPC Contracting.
Padraig is a member of various technical committees including;

NSAI/ETC/TC 03: S.R. 61936/ISEN 61936 Power installations exceeding 1kV (1.5kVdc) & ISEN 50110 Operation of electrical installations
IEC TC99/MT4: IEC 61936 Power installations exceeding 1kV (1.5kV dc)
CENELEC CLC / BTTF 62-3 BTTF 62-3 EN 50110 Operation of electrical installations

Chris Mc Loughlin (representing The Institution of Engineering and Technology (IET))
Chris is a Chartered Electrical Engineer having worked 40 years with ESB.
Experience includes: HV/MV stations & networks, Operation and Protection Specialist, Commissioning Specialist. Chris held Area and Group Engineer positions in ESB District/Regions and International experience with ESBI on behalf of ESB.
Post ESB he has being involved in International consultancy work in several countries covering Europe and Africa. He is a member of various technical committees including NSAI/ETC and also a member of NSAI/ETC/TC 03. Chris is a Fellow of Engineers Ireland and a Member of The Institution of Engineering and Technology and in that connection, he is Secretary of IET Ireland Network and Vice Chair of IET CC-EMEA.

Mick O'Grady
Mick is an Electrician with a H.Dip in the Management of Safety, Health and Welfare at Work and presently working as a coach in ESB focusing on culture transformation, has 35 years' experience in ESB having worked in a number of areas across the business including HV Maintenance & Installation, operation of HV systems up to and including 220kV, Protection Specialist, 10/20kV Network Manager/Controller, Safety Services Manager and H&S Manager for Major Generation Projects.

Gerard Buckley
Gerard has over 40 years' experience in High Voltage engineering project management and transmission system operations, working with ESB Networks and ESB International. Gerard is a past chairman the Electro-technical Council of Ireland. Gerard is currently a member of the Electro-technical Committee of the National Standards Authority of Ireland, which oversees the development of electro-technical standards in Ireland, covering both low voltage and high voltage systems. Gerard is a member of a number of NSAI Technical Committees.
Gerard is a Chartered Engineer and Fellow of Engineers Ireland.

Mick Hogan
Mick is a Chartered Electrical Engineer and Fellow of Engineers Ireland with 36 years' experience in the High Voltage Industry and is currently working in HVDC transmission operation & maintenance. Mick's background ranges from an Electrical Apprentice and an Electrician in ESB, to High Voltage Substation design and construction in Ireland & Australia.
Mick is also a member of NSAI/ETC/TC 03: S.R. 61936/ISEN 61936 Power installations exceeding 1kV (1.5kVdc) & ISEN 50110 Operation of electrical installations

Michael Smithwick
Michael is a Chartered Electrical Engineer with 20 years' experience varied across the Electrical Sector including Transmission and Distribution, Asset Management and Generation roles. Currently working on large scale Offshore Wind projects to ensure the efficient integration of renewable generation onto the transmission system.

Órla Burke
Órla is the current Chair of the Electrical Division of Engineers Ireland and sits on the Engineers Ireland Council and Executive Board. She holds a Master of Engineering Science (Electrical & Microelectronic) and is a Chartered Electrical with over fifteen years' experience in ESB International.
Experience extends from planning and Project Management of large scale, high capital, international networks projects to power system studies . Órla has completed projects as a Consultant Engineer in several countries in Africa and the Middle East from distribution level to 400 kV.

Appendix 2 – Questionnaire

Assessment of Competence - Questionnaire

Organisation:

Location:

Applicable Legislation and Regulations:

The purpose of the Questionnaire is to record for the above organization or jurisdiction;

a) levels of Authorisation including those defined in ISEN 50110

b) minimum requirements for education, training and experience applicable to each Authorisation Level

c) the format of the competence assessment process

d) competence requirements for the person responsible for carrying out the assessment and issuing Authorisations (Authorising Engineer).

e) audit template (if any) in use for the assessment and verification of organisations, responsible for and engaged in, Assessment of Competence and issuing Authorisations for Competent Persons.

1. Levels of Authorisation

Please provide information on Authorisation Levels used and how they compare with the following roles as described in EN 50110.

1.1. Person responsible for an electrical installation

1.2. Nominated person in control of an electrical installation during work activities

1.3. Nominated person in control of a work activity

1.4. Skilled person (electrically)

1.5. Other

2. Competence Requirements

Please provide information on the competence requirements for the roles described in 1, under the following headings;

2.1. Education

Role 1.1:

Role 1.2:

Role 1.3:

Role 1.4:

Role 1.5:

2.2. Training

Role 1.1:

Role 1.2:

Role 1.3:

Role 1.4:

Role 1.5:

2.3. Experience

Role 1.1:

Role 1.2:

Role 1.3:

Role 1.4:

Role 1.5:

2.4. Other

Role 1.1:

Role 1.2:

Role 1.3:

Role 1.4:

Role 1.5:

2.5. Certification

Role 1.1:

Role 1.2:

Role 1.3:

Role 1.4:

Role 1.5:

3. Competence Assessment Process

Please provide information on how the competence of individuals is assessed.
The following headings are for guidance only.

3.1. Formal Internal Procedure

3.2. Assessment by External Organisation

3.3. National or Industry Certification

3.4. Other

4. Competence Requirements for Authorising Engineer

Please provide information on the competence requirements for the Authorising Engineer.
The following headings are for guidance only.

4.1. Education

4.2. Training

4.3. Experience

4.4. Other

4.5. Certification

5. Audit Template for Assessment of Organisations

Please describe/provide the audit process/template (if any) in use for the assessment and verification of organisations, responsible for and engaged in, Assessment of Competence and issuing Authorisations for Competent Persons.

Information provided by:

Position:

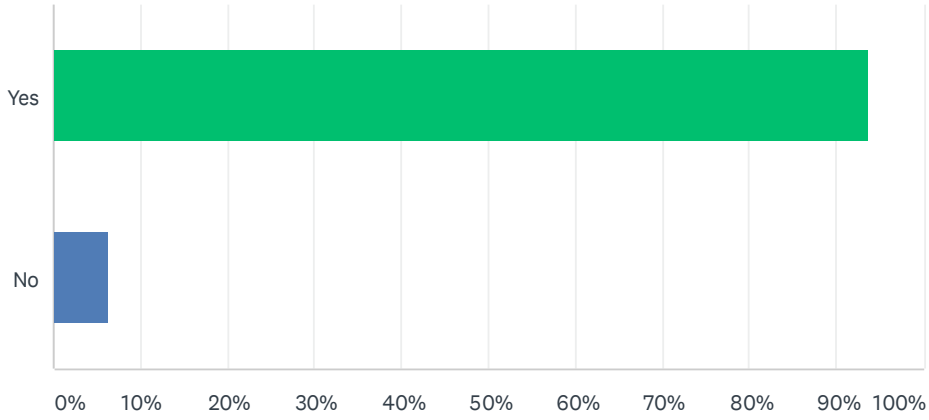
Information recorded by:

Date:

Appendix 3 – Survey Results

Q1 Are you a member of Engineers Ireland?

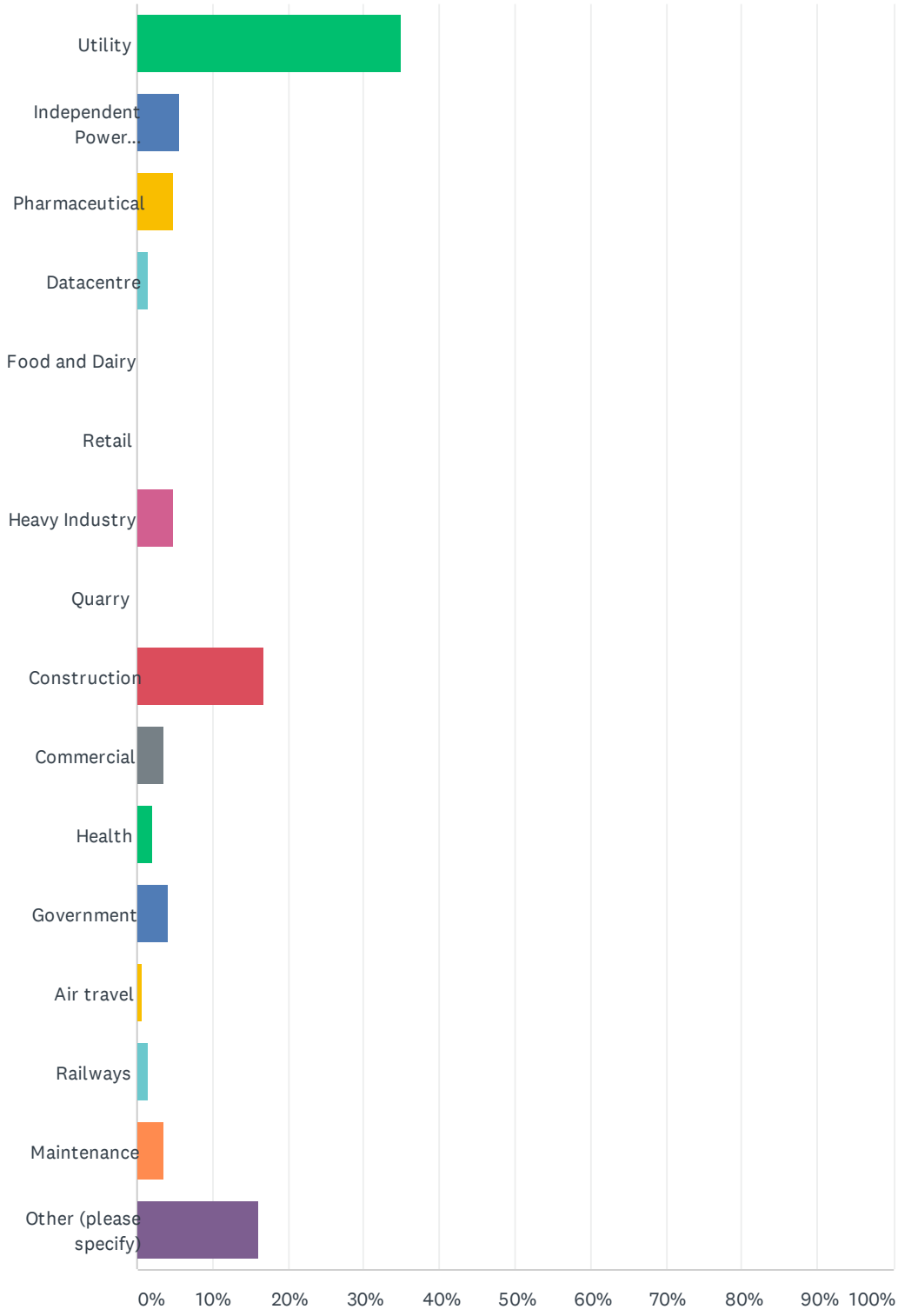
Answered: 143 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	93.71%	134
No	6.29%	9
TOTAL		143

Q2 Please select the description that best matches your sector

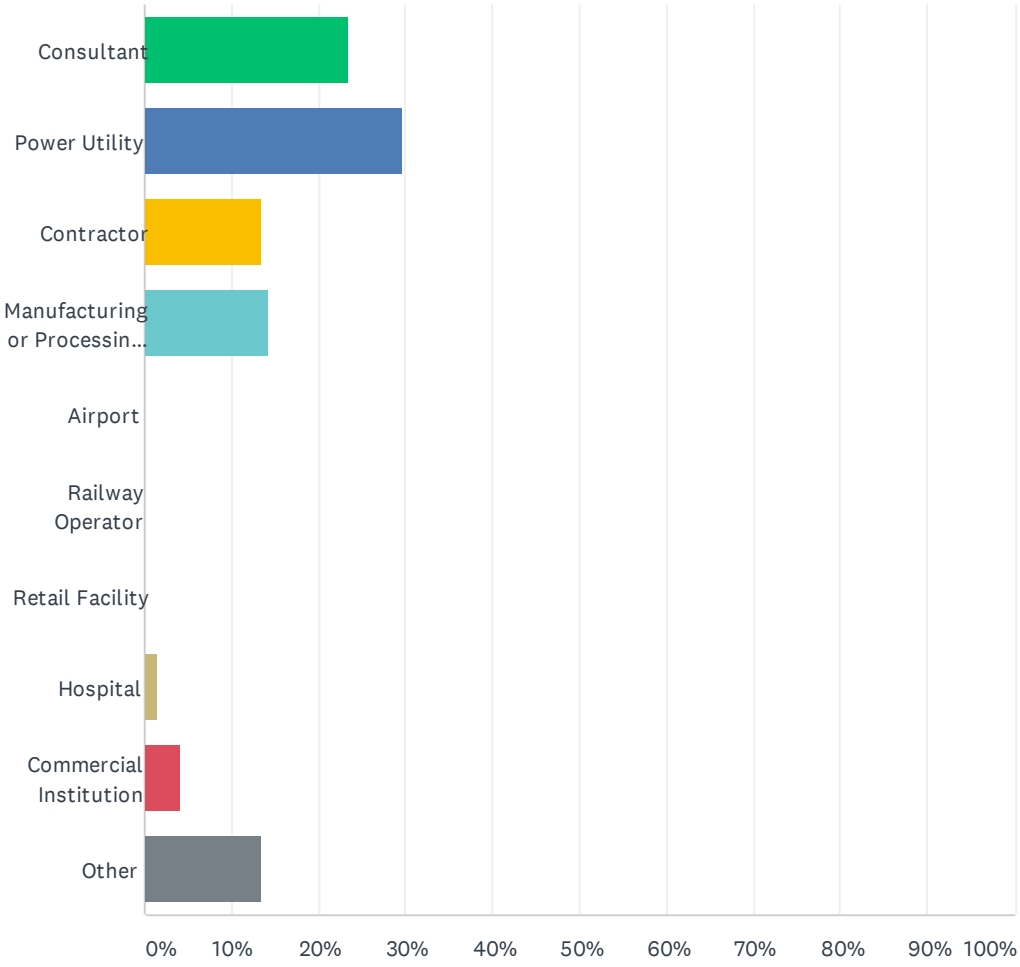
Answered: 143 Skipped: 0



ANSWER CHOICES	RESPONSES	
Utility	34.97%	50
Independent Power Generation	5.59%	8
Pharmaceutical	4.90%	7
Datacentre	1.40%	2
Food and Dairy	0.00%	0
Retail	0.00%	0
Heavy Industry	4.90%	7
Quarry	0.00%	0
Construction	16.78%	24
Commercial	3.50%	5
Health	2.10%	3
Government	4.20%	6
Air travel	0.70%	1
Railways	1.40%	2
Maintenance	3.50%	5
Other (please specify)	16.08%	23
TOTAL		143

Q3 Please select the description that best matches your Organisation

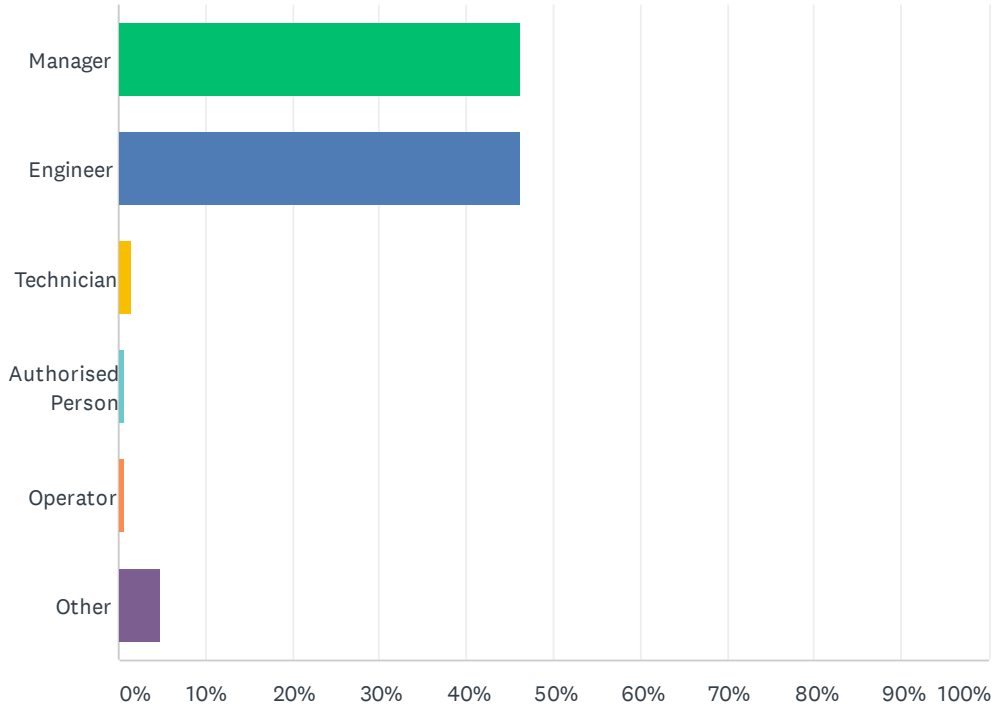
Answered: 141 Skipped: 2



ANSWER CHOICES	RESPONSES	
Consultant	23.40%	33
Power Utility	29.79%	42
Contractor	13.48%	19
Manufacturing or Processing Plant	14.18%	20
Airport	0.00%	0
Railway Operator	0.00%	0
Retail Facility	0.00%	0
Hospital	1.42%	2
Commercial Institution	4.26%	6
Other	13.48%	19
TOTAL		141

Q4 Please select the description that best matches your role

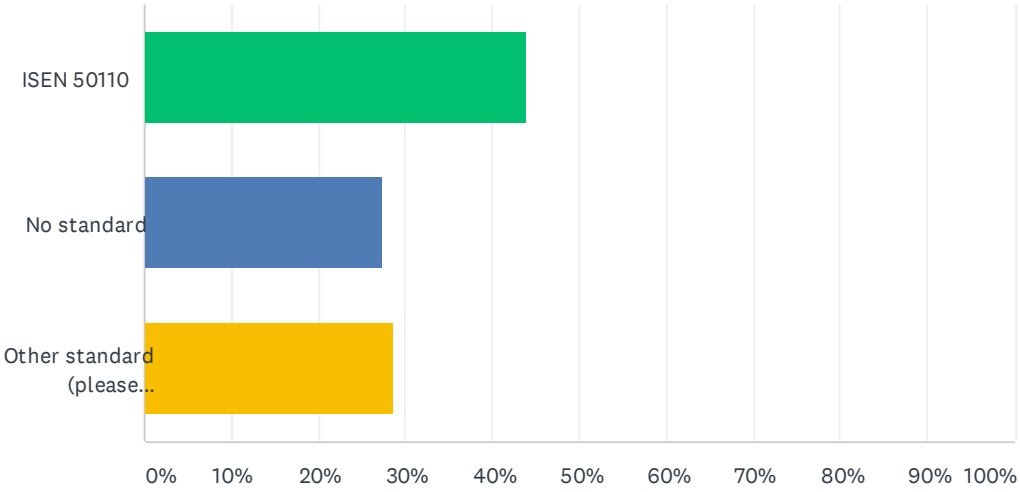
Answered: 143 Skipped: 0



ANSWER CHOICES	RESPONSES	
Manager	46.15%	66
Engineer	46.15%	66
Technician	1.40%	2
Authorised Person	0.70%	1
Operator	0.70%	1
Other	4.90%	7
TOTAL		143

Q5 In your organisation is the HV installation managed in accordance with:

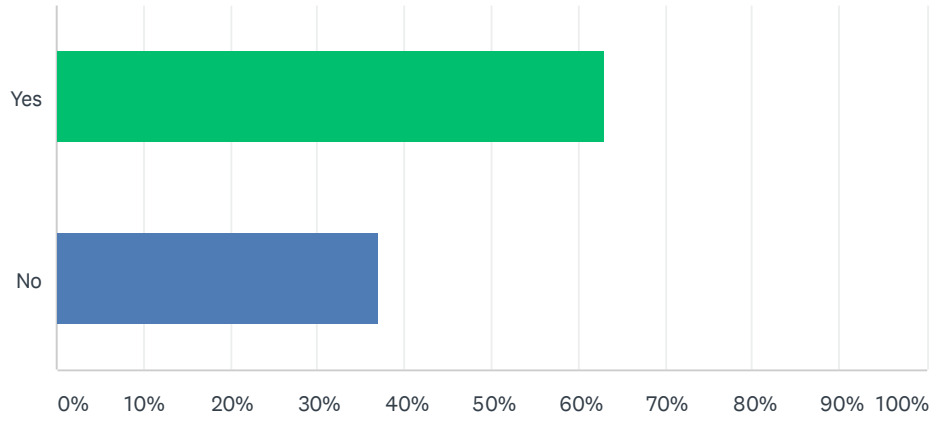
Answered: 91 Skipped: 52



ANSWER CHOICES	RESPONSES	
ISEN 50110	43.96%	40
No standard	27.47%	25
Other standard (please specify)	28.57%	26
TOTAL		91

Q6 Is there a formally nominated a person responsible for the HV installation (HV System Manager)?

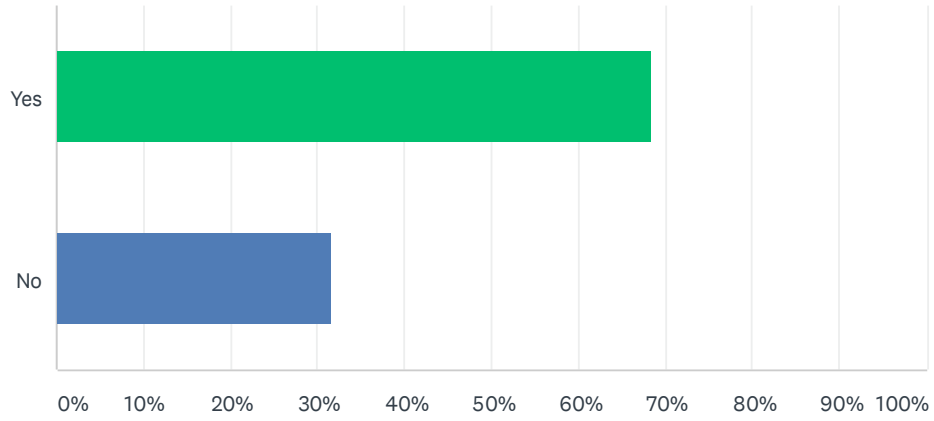
Answered: 89 Skipped: 54



ANSWER CHOICES	RESPONSES	
Yes	62.92%	56
No	37.08%	33
TOTAL		89

Q7 If yes, Is a formal assessment of competence carried out prior to nomination?

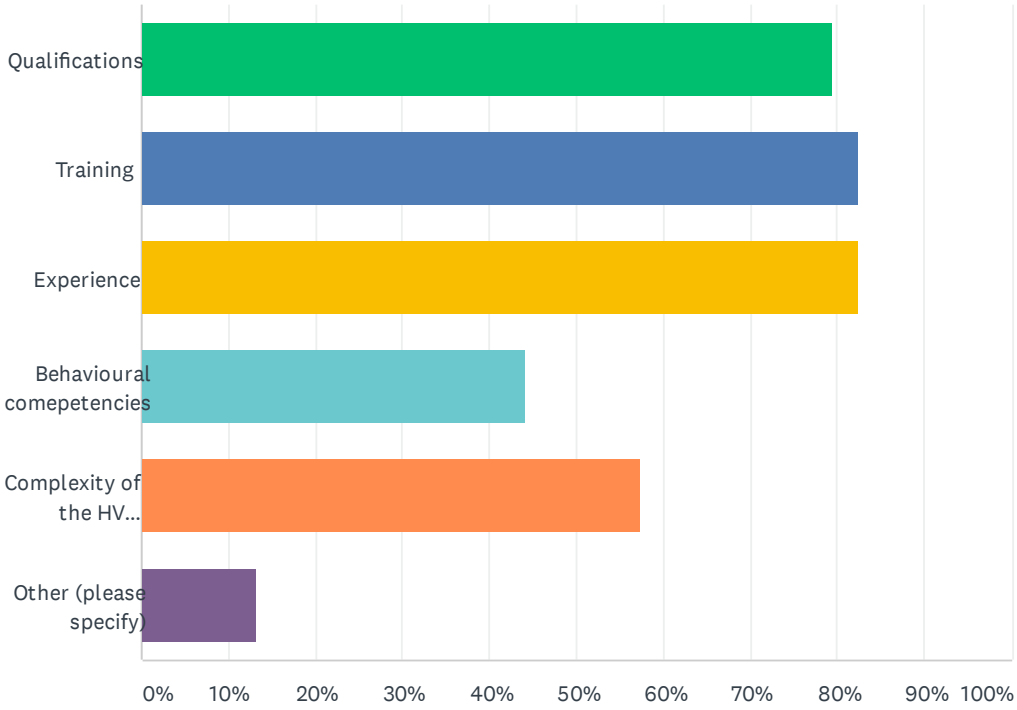
Answered: 73 Skipped: 70



ANSWER CHOICES	RESPONSES	
Yes	68.49%	50
No	31.51%	23
TOTAL		73

Q8 Does this assessment consider:

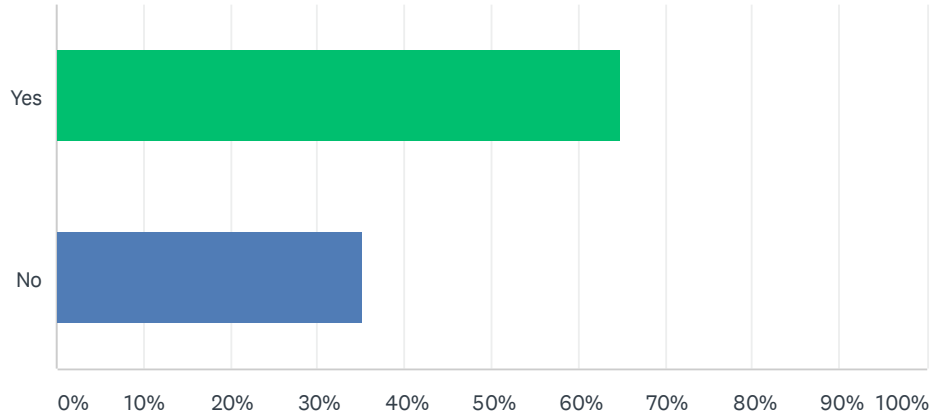
Answered: 68 Skipped: 75



ANSWER CHOICES	RESPONSES	
Qualifications	79.41%	54
Training	82.35%	56
Experience	82.35%	56
Behavioural comepetencies	44.12%	30
Complexity of the HV installation	57.35%	39
Other (please specify)	13.24%	9
Total Respondents: 68		

Q9 Has this nominated person had specific training for the role?

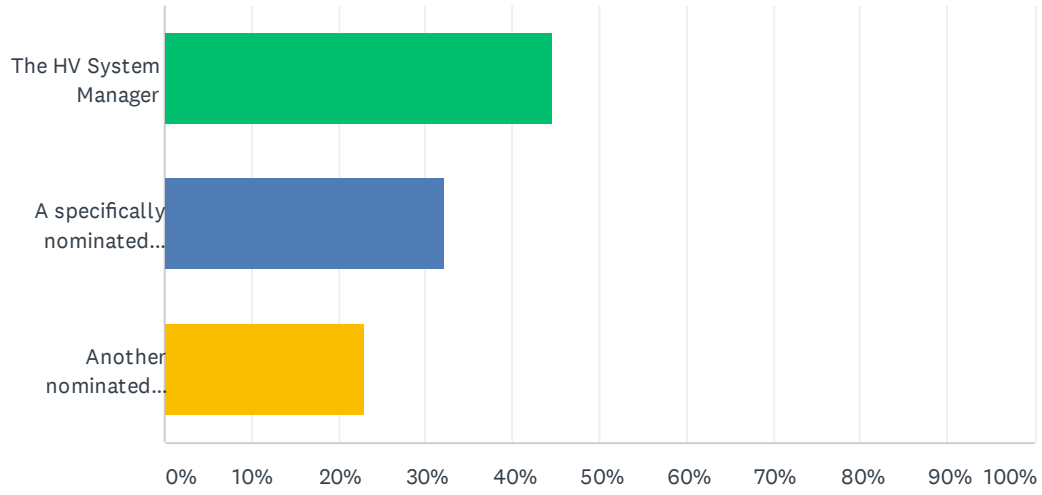
Answered: 77 Skipped: 66



ANSWER CHOICES	RESPONSES	
Yes	64.94%	50
No	35.06%	27
TOTAL		77

Q10 Is control of the HV installation during work activities the responsibility of:

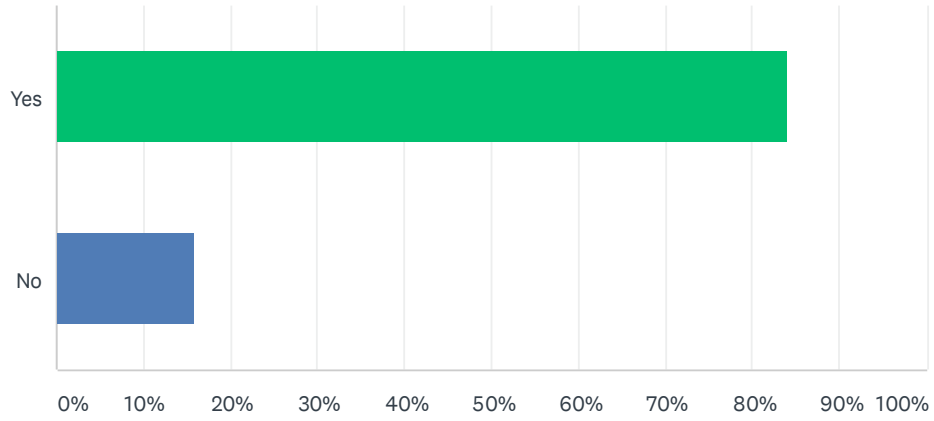
Answered: 65 Skipped: 78



ANSWER CHOICES	RESPONSES	
The HV System Manager	44.62%	29
A specifically nominated person (Control Engineer)	32.31%	21
Another nominated person - please specify	23.08%	15
TOTAL		65

Q11 Is a formal assessment of competence carried out prior to nomination?

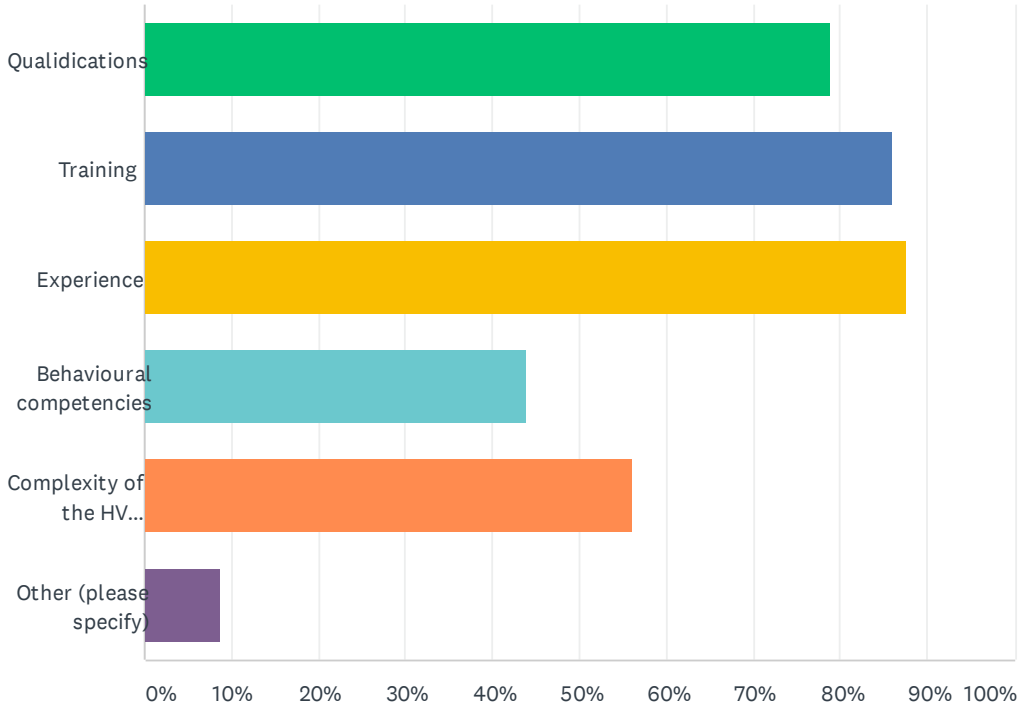
Answered: 63 Skipped: 80



ANSWER CHOICES	RESPONSES	
Yes	84.13%	53
No	15.87%	10
TOTAL		63

Q12 If yes, does this assessment consider:

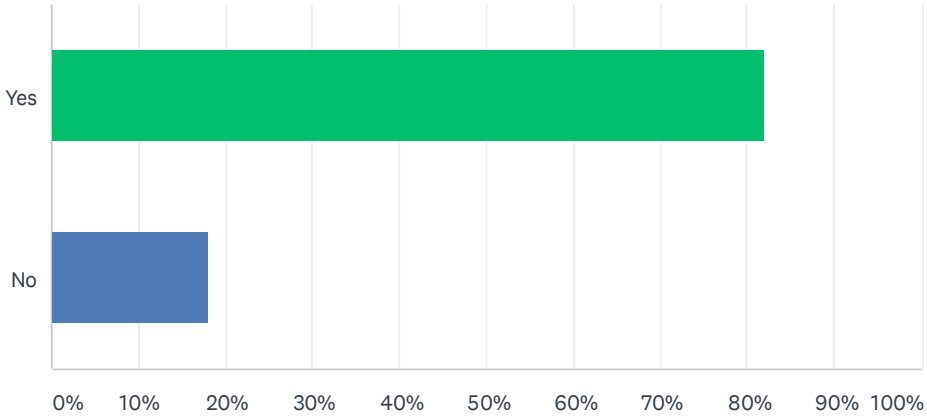
Answered: 57 Skipped: 86



ANSWER CHOICES	RESPONSES	
Qualidications	78.95%	45
Training	85.96%	49
Experience	87.72%	50
Behavioural competencies	43.86%	25
Complexity of the HV installation	56.14%	32
Other (please specify)	8.77%	5
Total Respondents: 57		

Q13 Has this nominated person had specific training for the role?

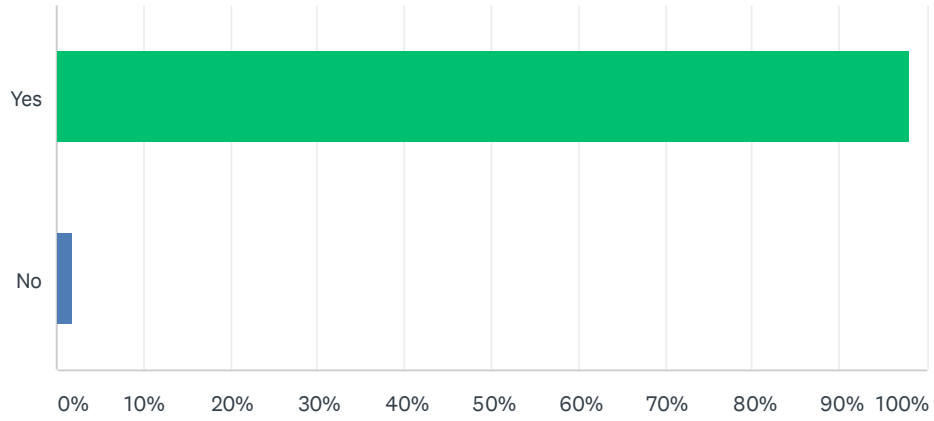
Answered: 61 Skipped: 82



ANSWER CHOICES	RESPONSES	
Yes	81.97%	50
No	18.03%	11
TOTAL		61

Q14 Is a person nominated to be in control of a work activity (Supervisor/ Person in charge of works)?

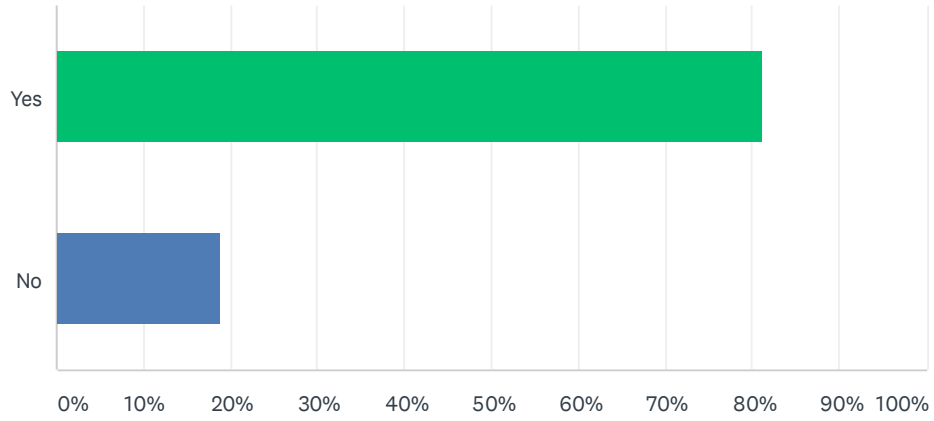
Answered: 53 Skipped: 90



ANSWER CHOICES	RESPONSES	
Yes	98.11%	52
No	1.89%	1
TOTAL		53

Q15 If yes, is a formal assessment of competence carried out prior to nomination?

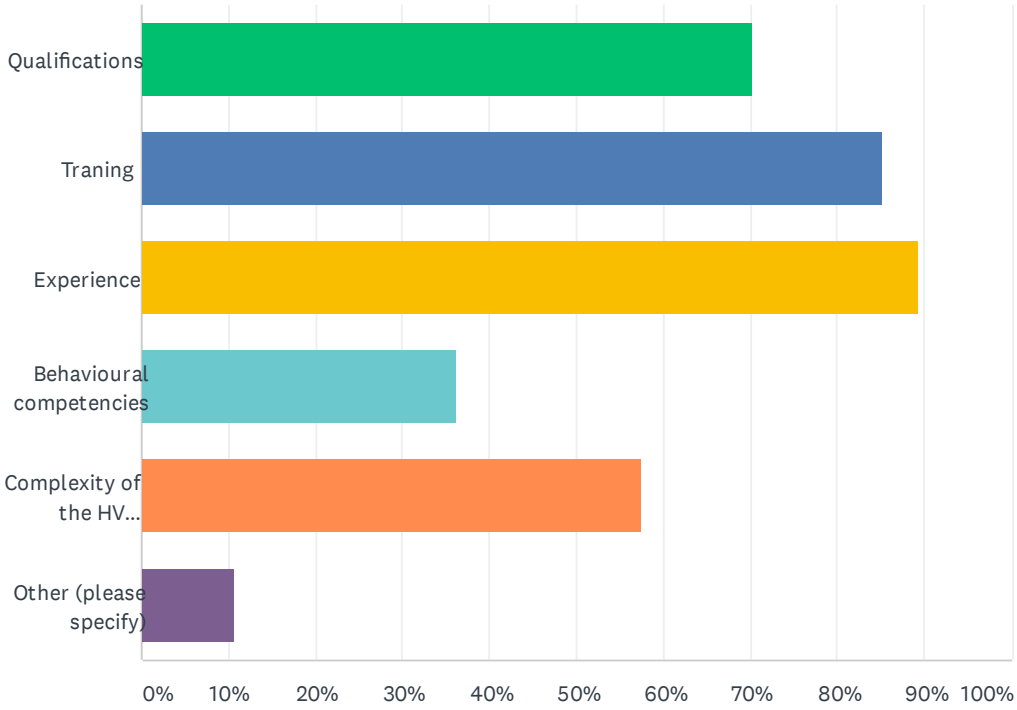
Answered: 53 Skipped: 90



ANSWER CHOICES	RESPONSES	
Yes	81.13%	43
No	18.87%	10
TOTAL		53

Q16 Does this assessment consider

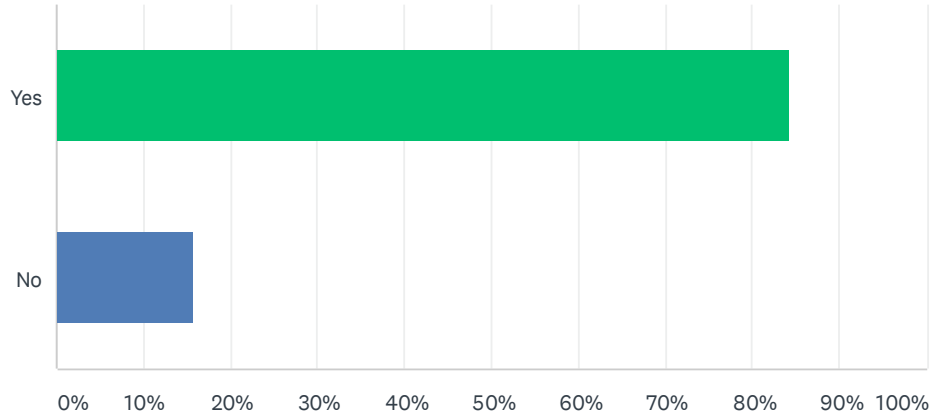
Answered: 47 Skipped: 96



ANSWER CHOICES	RESPONSES	
Qualifications	70.21%	33
Traning	85.11%	40
Experience	89.36%	42
Behavioural competencies	36.17%	17
Complexity of the HV installation	57.45%	27
Other (please specify)	10.64%	5
Total Respondents: 47		

Q17 Has this person had specific training for the role?

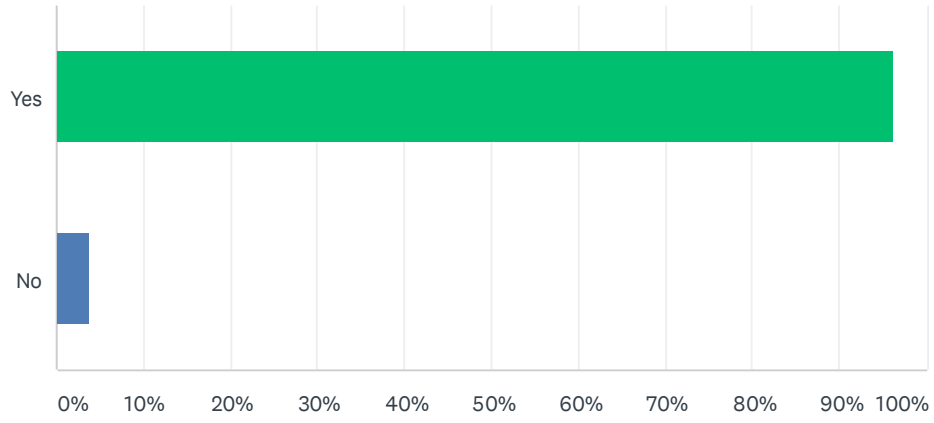
Answered: 51 Skipped: 92



ANSWER CHOICES	RESPONSES	
Yes	84.31%	43
No	15.69%	8
TOTAL		51

Q18 Is work carried out by skilled persons who are authorised to carry out specific tasks (Authorised Persons)?

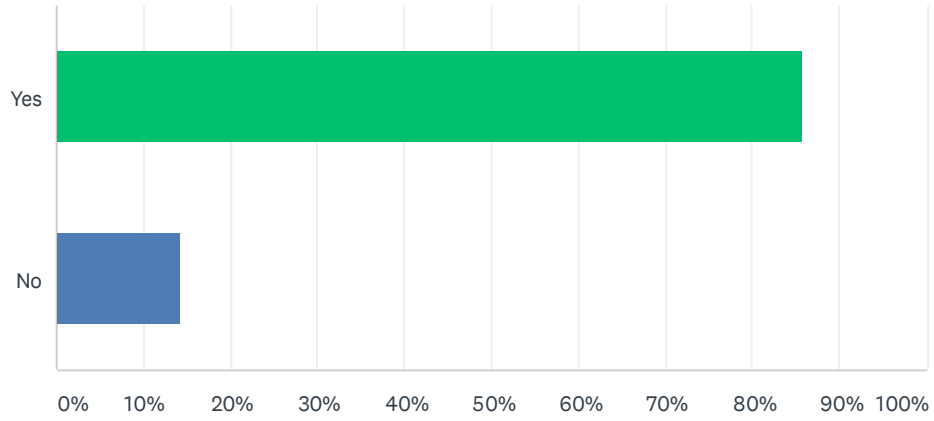
Answered: 52 Skipped: 91



ANSWER CHOICES	RESPONSES	
Yes	96.15%	50
No	3.85%	2
TOTAL		52

Q19 If yes, is a formal assessment of competence carried out prior to authorisation?

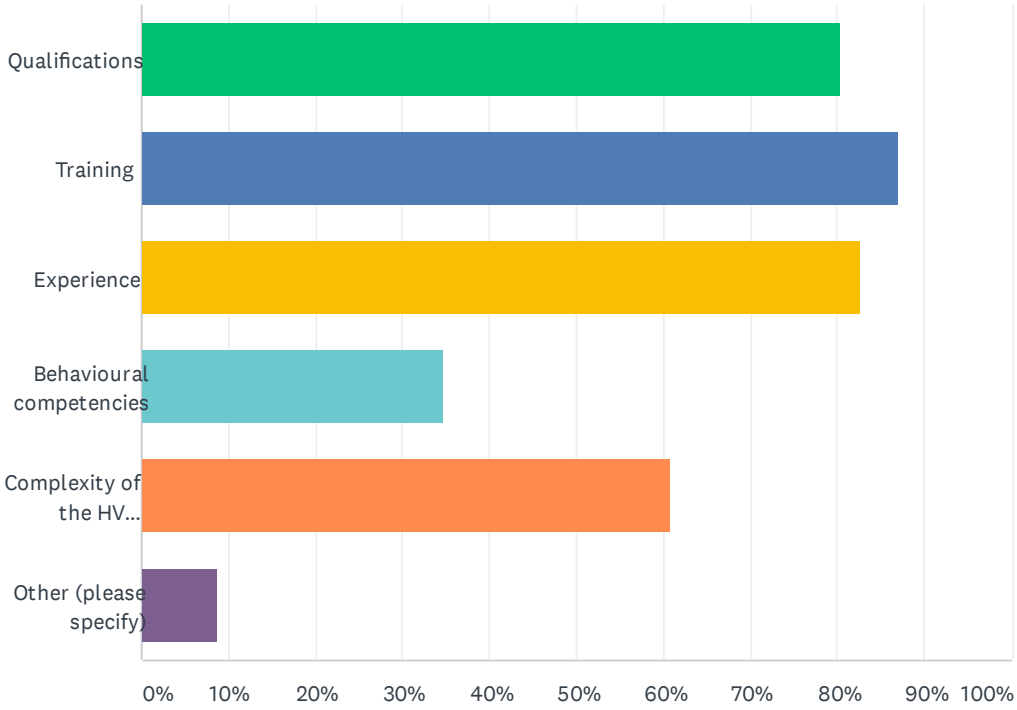
Answered: 49 Skipped: 94



ANSWER CHOICES	RESPONSES	
Yes	85.71%	42
No	14.29%	7
TOTAL		49

Q20 Does this assessment consider

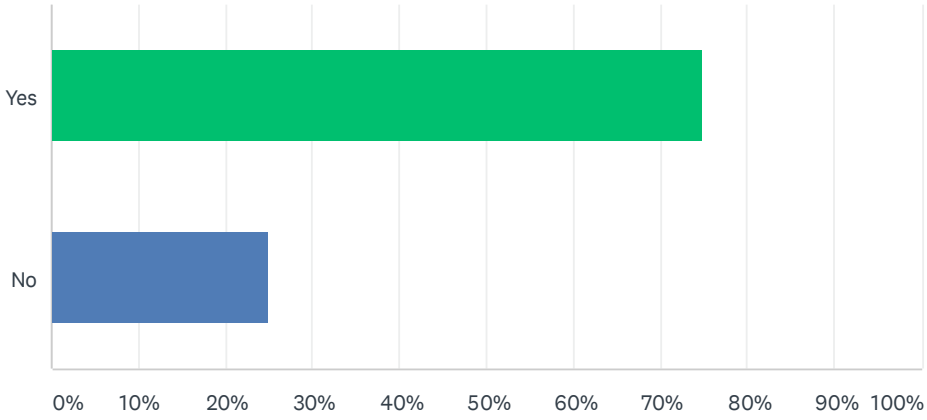
Answered: 46 Skipped: 97



ANSWER CHOICES	RESPONSES	
Qualifications	80.43%	37
Training	86.96%	40
Experience	82.61%	38
Behavioural competencies	34.78%	16
Complexity of the HV installation	60.87%	28
Other (please specify)	8.70%	4
Total Respondents: 46		

Q21 Do authorized persons get specific training for the task?

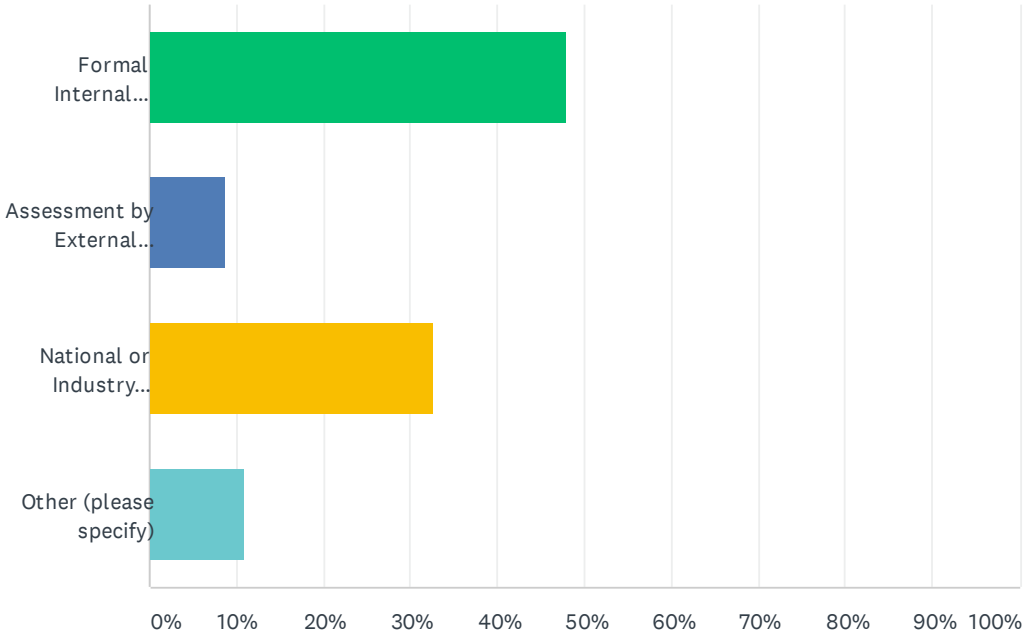
Answered: 48 Skipped: 95



ANSWER CHOICES	RESPONSES	
Yes	75.00%	36
No	25.00%	12
TOTAL		48

Q22 Is Competence Assessment of persons based on

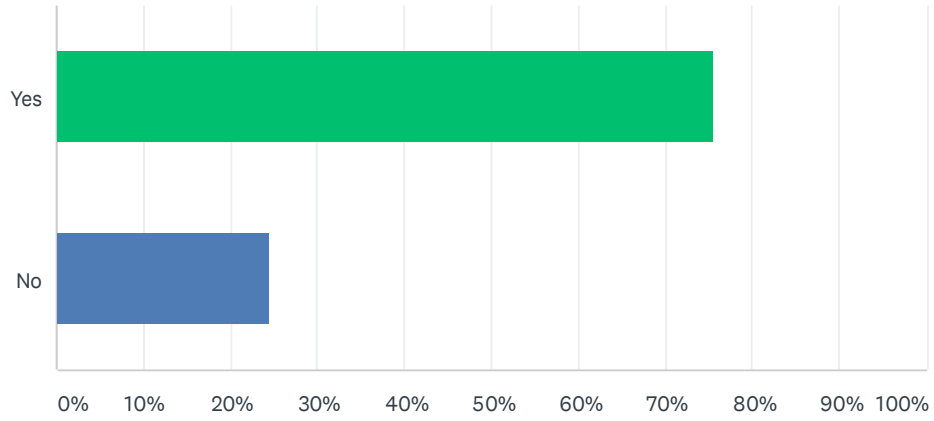
Answered: 46 Skipped: 97



ANSWER CHOICES	RESPONSES	
Formal Internal Procedure	47.83%	22
Assessment by External Organisation	8.70%	4
National or Industry Certification	32.61%	15
Other (please specify)	10.87%	5
TOTAL		46

Q23 Is Competence Assessment of persons the responsibility of a nominated person (Authorising Engineer)

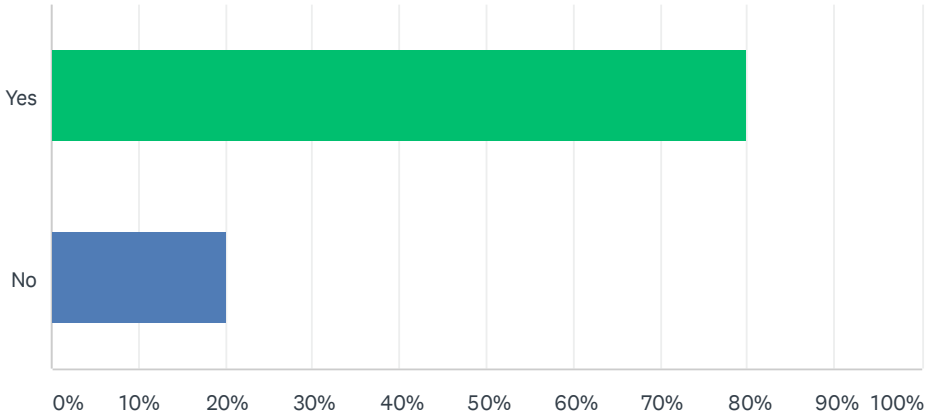
Answered: 45 Skipped: 98



ANSWER CHOICES	RESPONSES	
Yes	75.56%	34
No	24.44%	11
TOTAL		45

Q24 Is a formal assessment of competence carried out prior to nomination

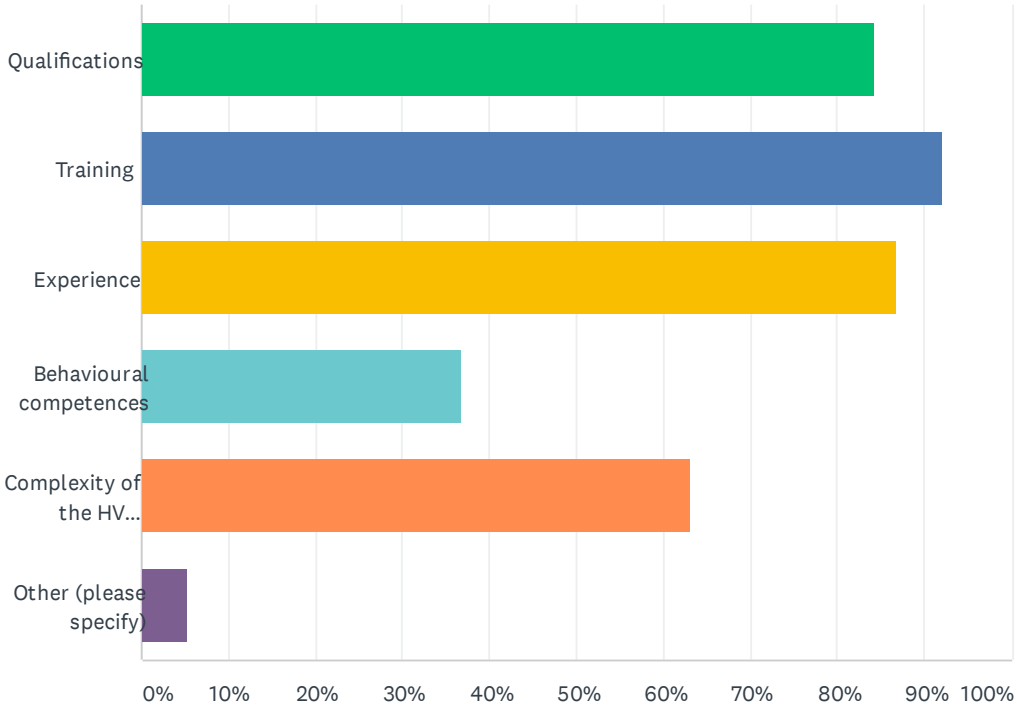
Answered: 45 Skipped: 98



ANSWER CHOICES	RESPONSES	
Yes	80.00%	36
No	20.00%	9
TOTAL		45

Q25 If yes, does this assessment consider

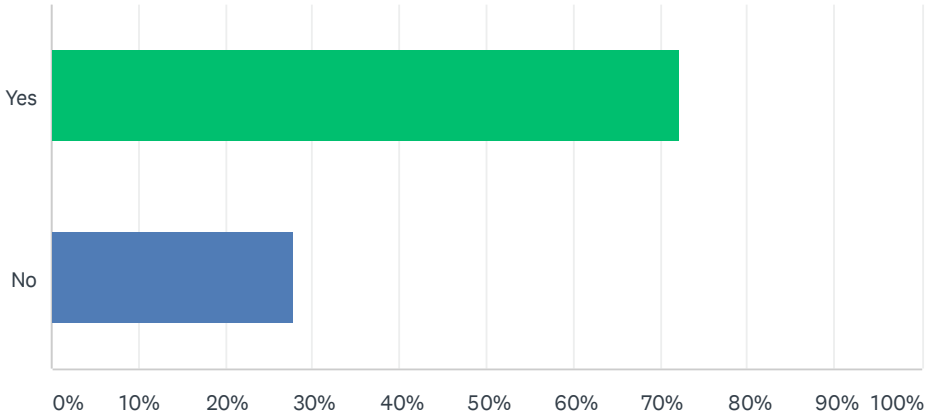
Answered: 38 Skipped: 105



ANSWER CHOICES	RESPONSES	
Qualifications	84.21%	32
Training	92.11%	35
Experience	86.84%	33
Behavioural competences	36.84%	14
Complexity of the HV installation	63.16%	24
Other (please specify)	5.26%	2
Total Respondents: 38		

Q26 Has the Authorising Engineer had specific training for the role?

Answered: 43 Skipped: 100



ANSWER CHOICES	RESPONSES	
Yes	72.09%	31
No	27.91%	12
TOTAL		43

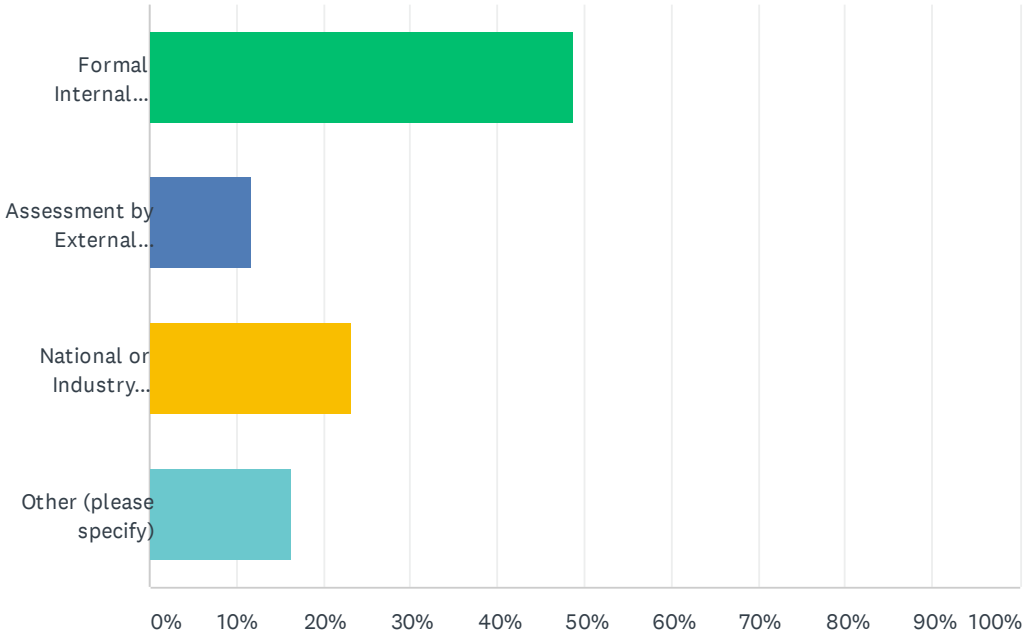
Q27 Please provide high level indication of the qualifications and training of your Authorising Engineer e.g. Chartered Engineer, formal or informal training.

Answered: 37 Skipped: 106

ANSWER CHOICES	RESPONSES	
Qualifications	97.30%	36
Training	64.86%	24
Experience - number of years in HV sector	89.19%	33

Q28 Is Competence Assessment of companies based on

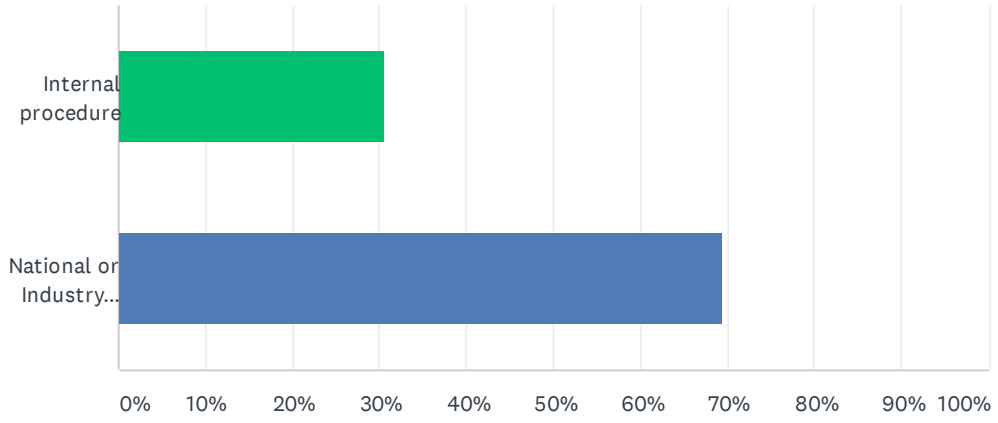
Answered: 43 Skipped: 100



ANSWER CHOICES	RESPONSES	
Formal Internal Procedure	48.84%	21
Assessment by External Organisation	11.63%	5
National or Industry Certification	23.26%	10
Other (please specify)	16.28%	7
TOTAL		43

Q29 In your opinion, should Competence Assessment of persons be regulated by

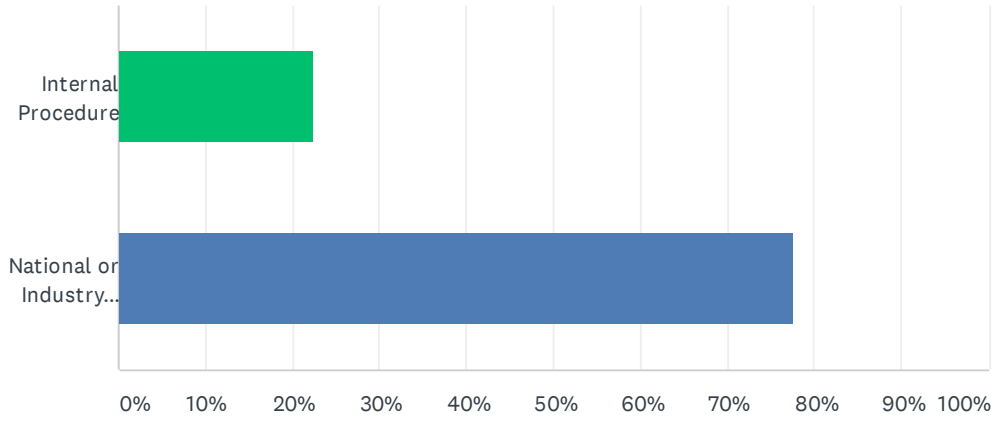
Answered: 49 Skipped: 94



ANSWER CHOICES	RESPONSES	
Internal procedure	30.61%	15
National or Industry Certification	69.39%	34
TOTAL		49

Q30 In your opinion, should Competence Assessment of companies be regulated by

Answered: 49 Skipped: 94



ANSWER CHOICES	RESPONSES	
Internal Procedure	22.45%	11
National or Industry Certification	77.55%	38
TOTAL		49

Q31 Please provide any other comments or suggestions not covered in the survey below

Answered: 15 Skipped: 128

Appendix 4 – Best Practice in Europe in regard to the use of EN 50110

ISEN 50110 Part 2 contains national regulations and references to regulatory bodies for each CENELEC country.

The following text is the Working Group's understanding of how some European countries integrate and reference EN 50110 into national regulations.

DENMARK

In Denmark, the **Danish Safety Technology Authority** is responsible for work that takes place on electrical installations including distribution systems and the **Danish Working Environment Authority** is responsible for work that takes place on machines.
While national regulations are in place in regard to distribution systems and live working, compliance with EN 50110-1 is considered a basic requirement to ensure safety.

FINLAND

In Finland, the **National Electrical Safety Act** [1], ensures that the use of electrical equipment and installations is kept safe. Section 83 states that "The (electrical) work is considered to meet the essential safety requirements referred to in section 82, if it is performed by applying the standards or publications referred to in section 84".
The referenced list of the standards [2] published on the **National Electrical Safety Authority** website, includes national standard **SFS 6002 (Safety in electrical work)**, which in turn includes the requirements of EN 50110-1 and additional national requirements such as the requirement for mandatory electrical work safety training, which has to be renewed every 5 years.
In summary, the Finnish electrical safety act references EN 50110-1 as the basic standard to be observed so that the "essential safety requirements" for electrical work are fulfilled.
[1] https://www.finlex.fi/fi/laki/ajantasa/2016/20161135
[2] https://tukes.fi/documents/5470659/8178747/Luettelo+S10-2019+S%C3%A4hk%C3%B6laitteistojen+turvallisuutta+ja+s%C3%A4hk%C3%B6ty%C3%B6turvallisuutta+koskevat+standardit/aac8d149-4409-7c08-2e5b-f67c33def1b4/Luettelo+S10-2019+S%C3%A4hk%C3%B6laitteistojen+turvallisuutta+ja+s%C3%A4hk%C3%B6ty%C3%B6turvallisuutta+koskevat+standardit.pdf?t=1548239911000

FRANCE

In France, standard **NF C 18 510** applies to the prevention of accidents due to electrical hazards during works and operations on public and private electrical installations. It is the technical reference document referred to in the Labour Code: article R4544-3, for the control of operations in an electrical risk environment.
This standard is fully in line with EN 50110-1 but provides more detail in many areas including;

(i) roles and responsibilities for employers and workers
(ii) Requirements for specific authorisations in regard to operations and voltage ranges

While no longer mandatory, this standard is recommended by Ministerial Decree (2017) and is considered a fundamental reference for Employers in regard to their duties to their employees working on or near electrical installations.

GERMANY

In Germany, the **Occupational Health and Safety Act** and the **Accident Prevention Regulations** are legally binding obligations for every company and every person.
The **Energy Industry Act** (Energiewirtschaftsgesetz) describes the requirements for energy installations and requires that energy installations are constructed and operated so as to ensure safety.
DIN standards provide the benchmark in regard to technical activities and are therefore fundamental to the application of the legal requirements. DIN EN 50110-1 is therefore accepted legally, as the basic requirement for ensuring safety in the operation of electrical installations.

NORWAY

In Norway, the **Directorate for Civil Defence and Emergency Planning** (DSB) provides **Safety regulations related to the maintenance and operation of electrical installations** [1] which states that DSB "regards the methods given in NEK EN 50110-1 to be those that best meet the safety requirements in the Regulations".
As such, compliance with EN 50110-1 is considered a basic legal requirement.

[1] https://www.dsb.no/globalassets/dokumenter/elsikkerhet-els/safety_regulations_related_to_the_maintenance_and_operation_of_electrical_installations.pdf

SWEDEN

In Sweden the **Swedish National Electrical Safety Board** [1] provides regulations in regard to electrical safety including ELSÄK- FS 2008:3 and ELSÄK-FS 2006:1.
Up to 2021, there was a presumption that applying harmonized standards, including SS EN 50110-1, would demonstrate compliance with legislation and regulations.
The **Work Environment Act** states that "The employer must take all necessary measures to prevent the employee from being exposed to illness or accidents" and the current interpretation is that there can be no presumption of compliance with the act by applying a standard, since if an accident did occur where the standard was being applied, the employer would not be considered compliant with the act, as if "all measures to prevent the employee from being exposed to illness or accidents" had been taken, the accident couldn't have happened.
SS EN 50110-1 is therefore considered a minimum standard to be observed and relevant training courses, such as provided by **Trainor** [2], include the requirements of SS EN 50110-1 in addition to the requirements of ELSÄK- FS 2008:3 and ELSÄK-FS 2006:1.

[1] https://www.elsakerhetsverket.se/en/
[2] https://www.trainor.se/

Appendix 5 – References

1) Safety, Health & Welfare at Work Act 2005. (SHAWW 2005)
2) Safety, Health & Welfare at Work Act (General Applications) Regulations 2007 to 2016 (referred to as SHAWW throughout this document)
3) Energy (Miscellaneous Provisions) Act 2006
4) I.S. EN 50110-1 OPERATION OF ELECTRICAL INSTALLATIONS - PART 1: GENERAL REQUIREMENTS, National Standards of Ireland, 2013
5) I.S. EN 50110-2 OPERATION OF ELECTRICAL INSTALLATIONS - PART 2: National Annexes
6) Shaping our Electricity Future Publications, Eirgrid Available at Shaping our Electricity Future (eirgridgroup.com)
7) Guideline for Assessing the Competence of Electrically Skilled Persons, ISSA Section for Electricity, ISBN 3-937824-00-6
8) Price Review 5 ('PR5') Determination Papers, CRU (available at Price Review 5 Electricity Networks - Commission for Regulation of Utilities (cru.ie))
9) CLIMATE ACTION PLAN 2021 Securing Our Future, Government of Ireland