Operator Training Guidelines

GENERATION PLANT

STAY LIVE
Electrical Industry Health & Safety Group

Controlled Document

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Contents

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1 Introduction

While operator competency has always been important in the electricity industry, through recent industry focus on process safety and succession planning, it has become clear that there is potential for improvement both in training new operators and in ensuring ongoing operator competency.

Currently training approach and content differs across the industry and there is much reliance on the experience within an aging workforce.

The introduction of a robust training pathway will ensure that industry knowledge and operational standards are maintained as well as enabling effective succession planning. A common approach to operator training is more efficient to develop and deliver and will improve consistency of standards across the industry. It will also facilitate investment back into a shrinking national resource pool.

Operator competency is a continual cycle, as summarised in Figure 1. This document has been created by StayLive to share best practice processes to ensure that industry operators gain and maintain necessary competencies following processes aligned with the competency cycle shown below.

Figure 1: Cycle of operator competency

2 Other Related StayLive Guidelines

This document covers topics relating to operator training and should be read in conjunction with the following StayLive guidelines:

- **Training and Competency Guideline:** The StayLive Training and Competency Guideline covers requirements for deeming staff competency through a 'Work Ready' and 'Work Capable' framework and gives guidance on when someone can be allowed to work unsupervised on a generation site. Click here for more information about StayLive training and competency guidelines.

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- **Process Safety:** The Process Safety Guideline is focused on ensuring that we broaden the understanding of process safety risks within the industry. The validation of competency section within this guideline is directly related to process safety. Click here for more information about StayLive process safety guidelines.
- **WorkSafe – Providing Information, Training, Instruction or Supervision for Workers:** Under the Health and Safety at Work (General Risk and Workplace Management) Regulations 2016 (GRWM Regulations), a person conducting a business or undertaking (PCBU) must ensure, so far as is reasonably practicable, the information, training, instruction and supervision provided to workers is suitable and adequate. Click here for more information about WorkSafe guidelines for training and supervising workers.
- **Emergency Response:** The Emergency Response Working Group is focused on ensuring that when the worst happens the industry is ready and willing to work together to keep the power on and maintain public safety. This working group works closely with the lifeline utility groups to understand readiness and responses in the case of emergencies. Click here for more information about StayLive emergency response guidelines.

3 Summary of Recommended Approach

3.1 Consistency

Fundamental operator capability standards need to be maintained consistently across the electricity industry. These standards allow operators to apply a recognised trade to a given task or problem, with the certainty that standards and capability are consistent across different sites and industry participants. Through collaboration across the electricity industry and Industry Training Organisations (ITOs), qualifications have been designed to suit these common, fundamental capability standards.

It must also be recognised that all plants, schemes and sites are different, and that capability assessment needs to cater for the differences.

To ensure a consistent standard of operator fundamentals and ensure site specific capability is trained and assessed, it is recommended that NZQA qualifications and site- or scheme-competencies are aligned in the development of pathways, assessment and collection of evidence.

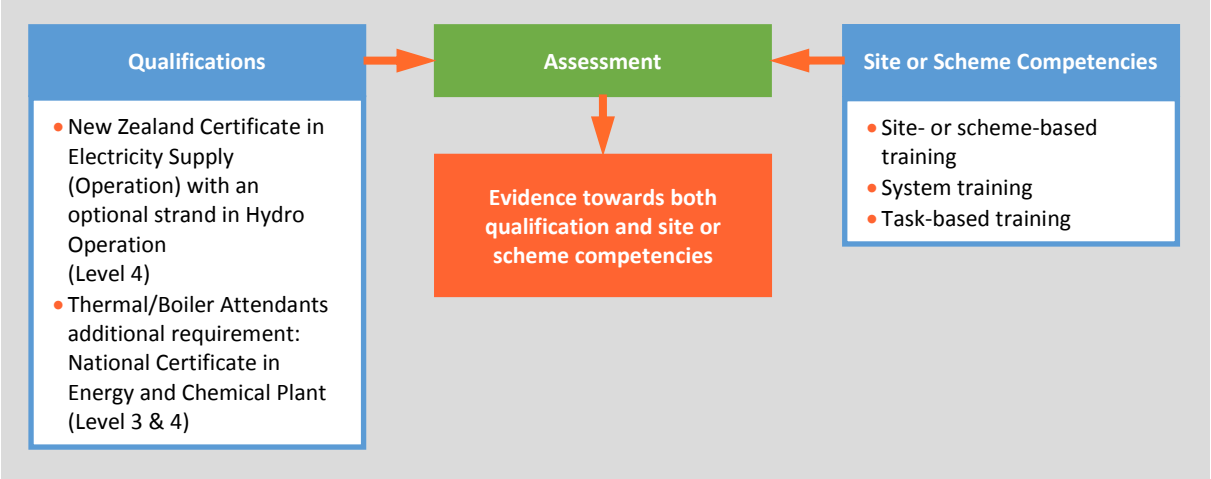

Figure 2: Complementary site or scheme competencies and qualifications

Training and assessment efficiency is maximised when one pathway can provide training, assessment and evidence towards both NZQA qualifications and site or scheme competency (Figure 2).

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3.2 Recommended Qualifications

StayLive recommends that operators gain the following qualifications to support fundamental operator capability standards.

Qualification	Application	Notes
New Zealand Certificate in Electricity Supply (Operation) with an optional strand in Hydro Operation (Level 4)	All generation operators	
ENCHEM – New Zealand Certificate in Energy and Chemical Field Operations (Level 4) with strands in Process Plant Equipment, Steam Plant, Geothermal Operation, Petrochemical Operation, Petrochemical Station, and Petrochemical Transfer and Storage	Boiler, process, gas turbine and geothermal operators	• ENCHEM 3 is recommended only for operators of small boilers • Operators of larger systems require ENCHEM 4 (StayLive defines a small boiler as under 20MW)

3.3 Additional Operator Competencies

Click here to go to the StayLive Training and Competency page for a competency matrix that further outlines unit standards and industry standard refresher frequencies for relevant competencies.

4 Qualifications

4.1 Overview

Embedding nationally recognised qualifications into operator pathways ensures the operations trade remains recognisable, transferable, consistent, relevant and regulated.

4.2 The Role of an Industry Training Organisation

4.2.1 Industry Training Organisations

Industry Training Organisations (ITOs) are the standard-setting bodies for the qualifications and unit standards that lead to nationally recognised qualifications. Any new qualifications or unit standards must be developed and submitted to NZQA for approval by an ITO. Once approved by NZQA they will be listed on the NZQA qualifications framework. The same rules apply when there is a request to amend a qualification or unit standard.

4.2.2 Connexis

Connexis is the qualification developer for all electricity supply qualifications, be they in generation or networks. Connexis must engage with key stakeholders to ensure the qualifications are serving their intended purpose.

Connexis must gain approval for a Programme of Industry Training (PIT) from NZQA. This Programme must align with the graduate profile outcomes of the qualification. This allows Connexis to offer PITs against qualifications for which another ITO is the qualification developer, eg, Primary ITO. ENCHEM (Energy and Chemical Plant) is a Primary ITO qualification that can be delivered through Connexis.

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A New Zealand Certificate cannot be awarded unless a trainee has completed an approved Programme of Industry Training through the ITO. This means that a trainee needs to be in a Training Agreement with the ITO.

4.2.3 Industry Involvement

As mentioned above, electricity supply qualifications are created by Connexis with the development of provisional resources and assessment packs often supported by our industry experts. It is important that as an industry we provide resource towards the development and review of qualifications, programmes and unit standards to ensure they continue to add value and are fit for purpose.

Unit standards and qualifications are reviewed every five years by ITOs through engagement with industry.

4.3 Private Training Establishment

A generation company can become an NZQA-registered Private Training Establishment (PTE), enabling the company to set its own provisional resources to suit an ITO qualification. A PTE needs to get a Programme of Study approved through NZQA if it wishes to deliver training towards a New Zealand Certificate qualification. Otherwise it will need to enter into an agreement with the ITO to use its approved PIT.

A PTE-registered organisation can write its own site- or scheme-specific training material and use that training material to deliver its Programme of Study. For a PTE to be able to write its own assessments and provisional resources, it must have someone internal who is trained and competent to unit standard 11552 – *Design and Evaluate Assessment Materials*, and have that material pre-moderated by the ITO

Companies that do not have a PTE registration will rely on an ITO to provide training information and assessment criteria, with which they will need to closely align site- or scheme-specific training pathways to provide suitable evidence. Trainees will also need to enter into a Training Agreement with the ITO to be awarded the qualification. Aligning site- and scheme-specific assessments with qualifications and providing evidence for both from one assessment or activity increases training efficiency.

5 Training Delivery

5.1 Overview

StayLive recommends that system- and/or task-based pathways are developed and delivered as they relate to specific plant and company processes and procedures. Qualification outcomes will need to be embedded into the pathways to ensure common fundamental operator capability requirements are concurrently trained and assessed.

The following approaches give structure to pathways and are described in this section:

- separating plant into systems and/or tasks to provide a **structured learning pathway**
- in situations where there are multiple schemes with similar plant types, breaking the training into **common** (generic) training topics and **plant-specific** training topics
- working through **task-based** training to competency

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- following a **phased** training and competency programme
- providing training **resources** covering system overview.

5.2 Structured Learning Pathway

StayLive recommends breaking plant and processes down into logical systems and/or tasks. A trainee can then work through one system or task at a time, which provides a structured learning pathway and a logical structure for collecting competency evidence.

Once individual systems and tasks have been identified, standards should be set specifying the minimum competency requirements for each component, against which competency can be assessed.

Figure 3 below shows an example of a generating unit broken down into systems. For each system, trainees must acquire certain knowledge and complete specific tasks to an agreed standard to be awarded competency.

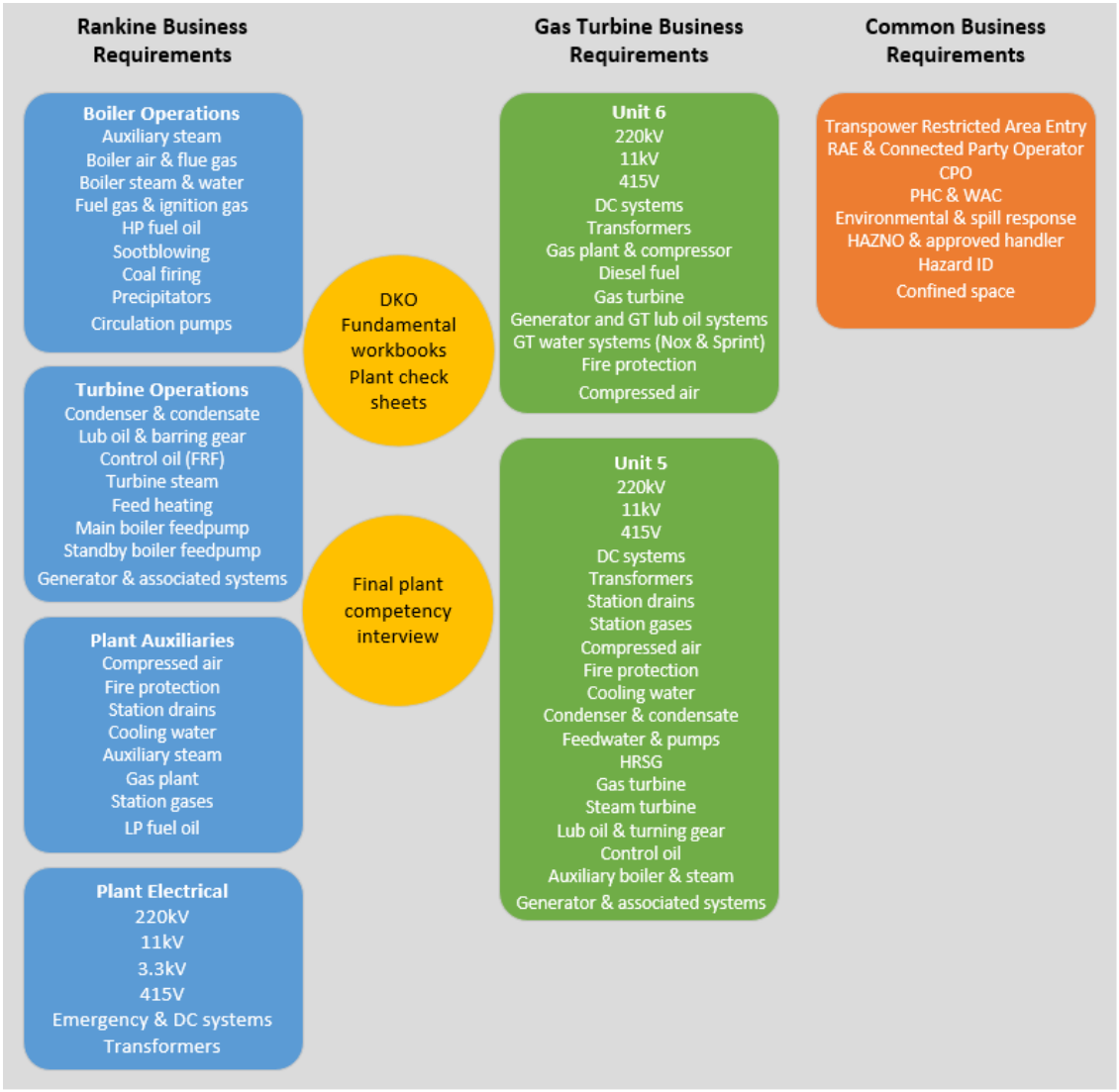

Figure 3: Huntly generating unit broken down into logical systems

Both qualification and site- or scheme-specific outcomes are met through the above pathway at Huntly.

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5.3 Multiple Schemes with Same Plant Type

If there are different sites or schemes with similar plant and equipment, StayLive recommends identifying opportunities to provide training and assessment that will achieve outcomes for these common areas. This will achieve greater efficiency in the training and assessment process. Focus on the distinct differences will need to be covered for each site or scheme.

A suggested process is described below.

Stage	Description
Development of Training Material	
1	The **generic or common** aspects across all the systems are identified.
2	Training material is developed covering the generic and common aspects.
3	The **distinct differences** between sites and schemes are identified.
4	Training material is developed for each of the sites or schemes covering the site- or scheme-specific requirements.
Delivery of Training	
5	Training in the common and generic aspects is delivered to a new trainee operator once only.
6	A training-needs analysis is conducted for each trainee operator to identify what underpinning knowledge the trainee already has and what knowledge gaps exist for the specific system or scheme. **Notes:** • A trainee operator may be new to the operating role, or already competent for other sites or schemes, so the knowledge gaps will differ for each trainee. • The validation of competency process (see section 8) can be used to help identify existing knowledge and gaps.
7	Site- or scheme-specific training is delivered to the trainee operator based on identified gaps in knowledge.
Assessment of Competency	
8	Competency assessments are conducted for each site, requiring operators to locate plant at the site, explain the plant function and any potential deviations, and meet other company competency assessment requirements.

5.4 Phased Training and Competency

StayLive recommends following a phased training and competency approach. This means staging fundamental operating capability requirements and site- or scheme-specific competencies into a logical sequence that complements the progression of an operator from familiar to specialist.

It is advisable to start with tasks that are predictable and repeatable, and progress through to tasks that are uncommon or irregular.

Training in tasks such as switching, applying earths and applying access permits should be carried out further through an operator's progression, after relevant operating fundamentals and practical task training has taken place. Figure 4 below shows an example of a staged operator pathway.

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Figure 4: Phased training and competency from familiar to specialist (example only)

The table below provides more detail about the various levels of competency in Figure 4. Note, the pathway described below is an example only.

Level	Competency	Description
Level 1	Foundation Generation Technician	Introductory concepts; stepping stones to practical activities; no direct plant accountability; working under supervision; "Licence to learn"
Level 2	Duty Acting Team Member (DATM) Certification	Complete plant and system familiarisation; competent with safety requirements; knows own limitations and when to ask for help; able to be on call – initial responder; full responsibility for certain tasks
Level 2 + AP	Authorised Person	L1, L2 + safety precaution applier; HV switching
Level 3	Certificate of Competence	L1, L2 AP + NZQA Operator (new level 4) achieved; all tasks or roles up to and included in stage 2 are the minimum requirement for a fully qualified Generation Technician; significant practical experience; can provide guidance to others
Level 3 + SAP	Senior Authorised Person	L1, L2, AP, L3 + Senior Authorised Person
Level 4	Expert	L1, L2, AP, L3, SAP + significant practical experience on the job; L4 competencies are a progression from the minimum requirements of a fully qualified Generation Technician; able to support training and assessment; leading teams
Level 5	Specialist	Non-position-specific competencies that build on previous levels

5.5 Task-based Training and Competency

5.5.1 Training and Supervision

StayLive recommends that trainees complete the practical operational tasks identified for each system under supervision until they have reached the level of competency required for assessment.

5.5.2 Competency Assessment

Trainees under competency assessment are to be observed by a competent assessor (see section 6) for that system or task who will assess the trainees against an agreed standard. When a trainee has completed all tasks satisfactorily and displayed appropriate knowledge and attitudes, the assessor can award competency to the trainee.

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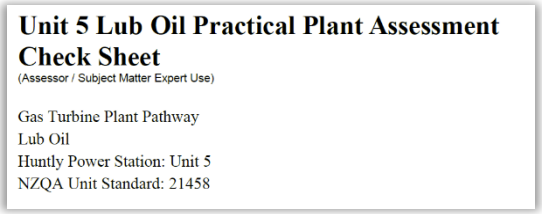
Typical competency assessments require trainees to:

- locate plant items
- explain plant function
- explain plant deviation
- operate the plant safely
- report and record in log sheets
- hand over plant.

5.5.3 Same Evidence for Task-based and NZQA Competency Assessment

Evidence collected from system- and task-based assessments can also be used as evidence for NZQA unit standards. Using the same evidence for both competency assessments makes the process more efficient. For example, evidence of tasks learned on a lube oil system also provides, in part, evidence for unit standard 21458 – *Operate a steam turbine in an energy and chemical plant.*


Unit 5 Lub Oil Practical Plant Assessment Check Sheet
(Assessor / Subject Matter Expert Use)

Gas Turbine Plant Pathway
Lub Oil
Huntly Power Station: Unit 5
NZQA Unit Standard: 21458

Figure 5: Extract from assessment check sheet for both in-house and NZQA competence assessment

5.6 Pathway Overview

5.6.1 Introduction

An overview detailing how individual tasks fit into the bigger picture is a useful tool for trainee operators. This can also be used for development planning and opportunities.

5.6.2 Online Training Programmes

Online platforms enable self-directed learning and access to all relevant information about each step of the training pathway. The online programme should show:

- the progression of training and the tasks required to be completed at each step
- clear objectives, instructions and trainee expectations for each required task
- task-based training check sheets
- provisional learning resources.

Figure 6 shows an example of an online training programme with a staged approach, and the 'Operate Plant' section expanded below to show the individual stages. Each of the topics listed in the top screen (eg, Generation Principles, Online Systems, etc) has corresponding staged milestones.

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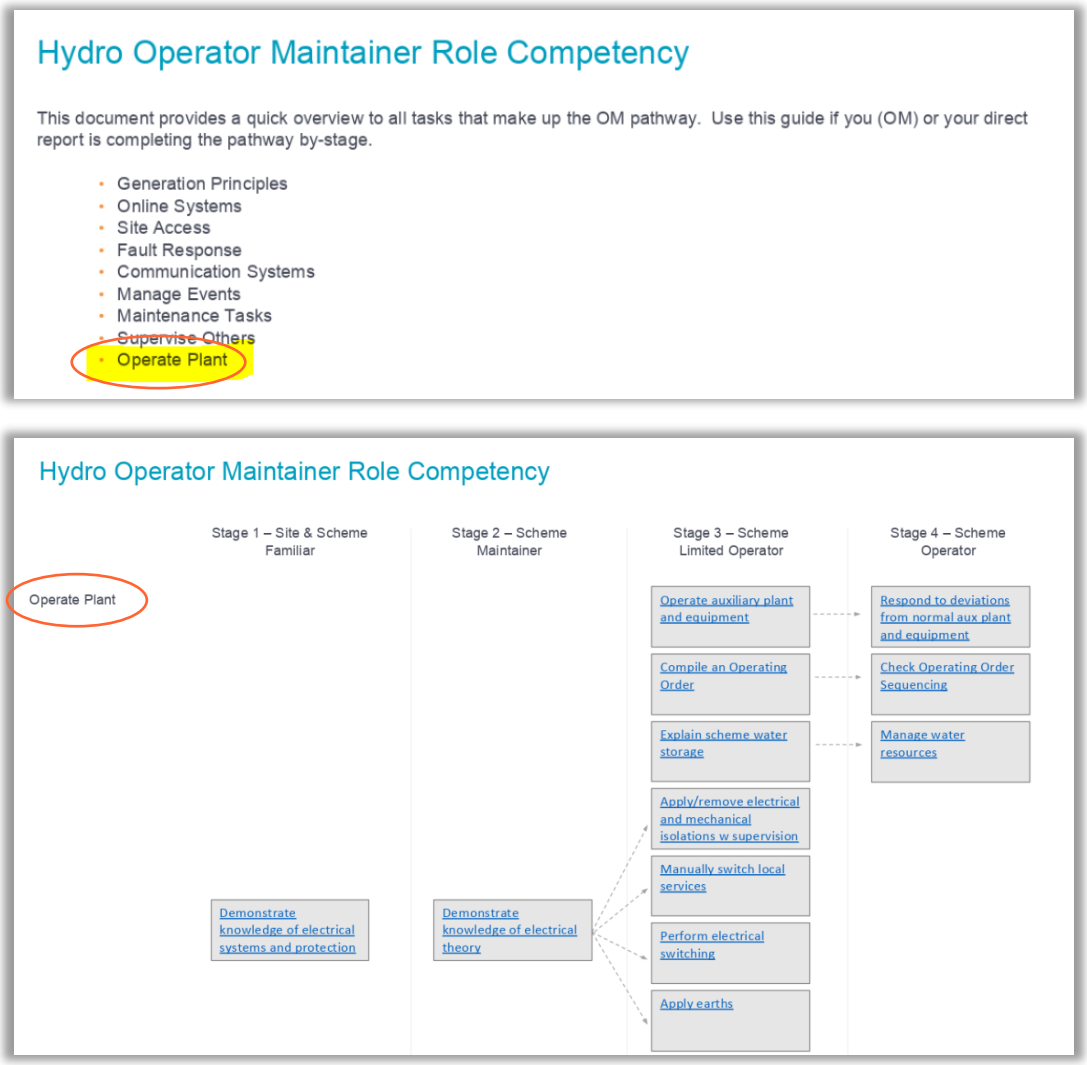

Figure 6: Example of online training programme with staged approach

5.7 Learning Resources

Learning resources need to be made available to trainees. Task-based training usually focuses on practical teaching and learning, but system familiarity will still be required by the operator to understand how the tasks fit into the bigger picture.

Overview information is provided before any practical task-based training to give some context to the practical training. Examples of items to cover in overview resources include:

- plant identification
- plant roles
- plant deviations, and response.

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6 Assessor Requirements

6.1 Task-based Assessors

Task-based assessors must witness the trainee complete a task to the agreed standard before they deem the trainee competent in that task.

Only people personally competent in a particular task may assess a trainee for competency in that task.

6.2 NZQA Unit Standards Assessors

6.2.1 Assessors

A registered Connexis assessor must deem all evidence requirements as having been met before submitting a unit standard for completion.

Registered Connexis assessors have industry experience and extensive technical knowledge and skills. All workplace Connexis assessors must hold unit standard 4098 – *Use standards to assess candidate performance or have demonstrated equivalent knowledge and skills*.

Organisations may have their own registered Connexis assessors, or alternatively, be a PTE who has its own assessors.

To ensure all registered assessors have sufficient knowledge and skills, assessors are provided with an assessment scope, which reflects the experience and qualifications the assessor currently holds and determines what unit standards they may assess.

Connexis assessors are moderated to ensure:

- assessment decisions are fair, valid and consistent
- assessment decisions are reliable and consistent between assessors.

Moderation supports assessors and providers to meet industry standards and helps identify where improvements may be made.

6.2.2 Assessor Training

To be a competent assessor of unit standards, an assessor must hold US 4098, but assessor training courses may also provide unit standard 11281 – *Prepare candidates for assessment against standards* and unit standard 18203 – *Verify evidence for assessment*.

Assessor training courses take from one to two days. In addition to training, to achieve US 4098 trainee assessors must submit actual assessments they have completed in the workplace using pre-moderated assessment guides.

Note: Some providers can provide (at a cost) pre-moderated assessment guides if the trainee assessor is unable to obtain them through an ITO or workplace.

6.2.3 Connexis Assessor Forums

Registered Connexis assessors must attend forums designed to maintain assessment consistency within the industry. These forums take place yearly. Click here for more information about Connexis assessment and moderation.

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7 Evidence for Competency Assessment

7.1 Evidence

There are many ways a trainee and assessor can collect evidence of competency to gain site- or scheme-specific competency and operating fundamentals. In many cases, the same evidence can be used for assessing both operating fundamental competency (NZQA-based) and site- or scheme-specific competency.

Evidence of…	Is Provided Through…

Practical skills	Assessment sheets from relevant task-based training, combined with any or all of the following:
	• log book entries showing completion of a task
	• computerised maintenance management system (CMMS), eg, Maximo, work orders capturing the following:
	  ○ work order description
	  ○ specific job plan details
	  ○ trainee labour booked to the work order
	• trends – collected while operating plant
	• photos of the trainee completing a task
	• access permits
	• operating orders
	• attestation or recognition of current competency (RCC) – operators with substantial industry experience can gain a qualification by proving their knowledge through prior learning records, attestation and evidence of experience.

Theoretical knowledge	Workbooks, combined with: • interviews • task-based assessment questioning • attestation or recognition of current competency (as for practical skills above). **Note:** These assessments need to be provided by an ITO qualification provider or be pre-moderated in-house (in the case of a PTE) if the assessment is going to form part of a unit standard or NZQA requirement.

7.2 Record Keeping

Organisations and trainees should keep a copy of their employee learning records for the following reasons:

- to ensure consistency of training approach
- to ensure training completion
- to prove competency including during an operational event or incident.

Internal assessors must keep a copy of all NZQA unit standard documentation in case of post-moderation.

Companies registered as a PTE must keep all training records for post-moderation.

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7.3 Attestation

Attestation is a formal verification that something is true or authentic. An attestation form is a document to confirm that an employee has suitable experience, knowledge and behaviours to perform a task.

Attestations are useful during a recognition of current competency (RCC) process for someone who may have similar training or experience to that required by a company, or as a means of crediting significant operational experience towards formal training unit standards.

Many organisations require a line manager to provide attestation as final sign-off for operator competency after the trainee has completed all required training. The attestation provides sign-off that the line manager ensures (1) that the training has been completed, and (2) that the trainee has shown all the required behavioural requirements and is ready to be deemed competent.

Note: Attestation forms must not be confused with task-based training sign offs; they do not provide evidence of task-based training.

8 Validation of Competency

8.1 Definition of Competency

Competency is the ability to consistently undertake a task or role to a recognised standard and is a combination of observable and measurable knowledge, skills, abilities, and personal attributes that contribute to enhanced employee performance and ultimately result in organisational success.

8.2 What Is Validation of Competency?

The validation of competency process provides a structured platform to ensure that staff engaged in key safety activities remain competent to do so. It also ensures that staff are aware of the ongoing level of competence expected from them to perform their role.

Validation of competency can be achieved by periodically assessing staff on defined tasks and knowledge against agreed competency standards.

8.3 Situations Benefitting from Validation of Competency

For some work tasks and situations, it is difficult to maintain ongoing competency through practical application. In such cases, validation of competency processes is useful to ensure that staff maintain the knowledge necessary to carry out these tasks when they do occur. Examples of such situations include:

- infrequent tasks – eg, unit start-ups and shutdowns are infrequent on some generation plant
- staff resource allocation – in addition to some tasks being infrequent, when they do take place, not all staff get to work on them; staff can go sustained periods without completing certain tasks
- remote control centres – remote control centres may occasionally require site staff to run plant locally during communications failures
- process and plant changes – when an operating process or item of plant is changed it should be communicated to operations staff as part of the change control process, however, a validation of competency process ensures that any changes have been understood and have been sustained within operations staff practices

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- emergency operating – emergency operating is infrequent and will often call on someone who has never experienced the actual event before.

Employers or persons conducting a business or undertaking (PCBUs) have an obligation to ensure employees are competent to undertake the task they have been hired for. Employers must be able to show evidence of how they ensure competency of their employees; simply holding a licence or qualification doesn't necessarily prove competence. The validation of competency process is a tool for employers or PCBUs to prove they have met their obligations by assessing theoretical knowledge and practical skills of new employees before they commence work.

The validation of competency process is also useful for proving existing staff have maintained key competencies throughout their tenure.

8.4 Validation of Competency vs Refresher Training

There are clear legislative guidelines outlining the role of validation of competencies and refresher training for employees but there is a confusion between the two processes.

The validation of competency process seeks **evidence** of competency whereas refresher training is based on keeping employees skills current by providing **training** on changes in technology, legislation and best practice.

8.5 The Role of Validation of Competency in Process Safety

8.5.1 Maintaining Process Safety Barrier Effectiveness

Operator competency is a recognised barrier to a high-level risk or high impact event within a process safety system. As with any process safety barrier, systems must be in place to ensure operator competency remains effective. Figure 7 shows a threat line from a process safety system; the threat in this example is 'Loss of Control/Protection Systems'. The barriers on the threat line display the identified measures and systems in place to prevent the high-level event from occurring, with operator procedures and operator competency forming two of the barriers. The barriers are rated against their effectiveness and are measured to ensure they remain effective.

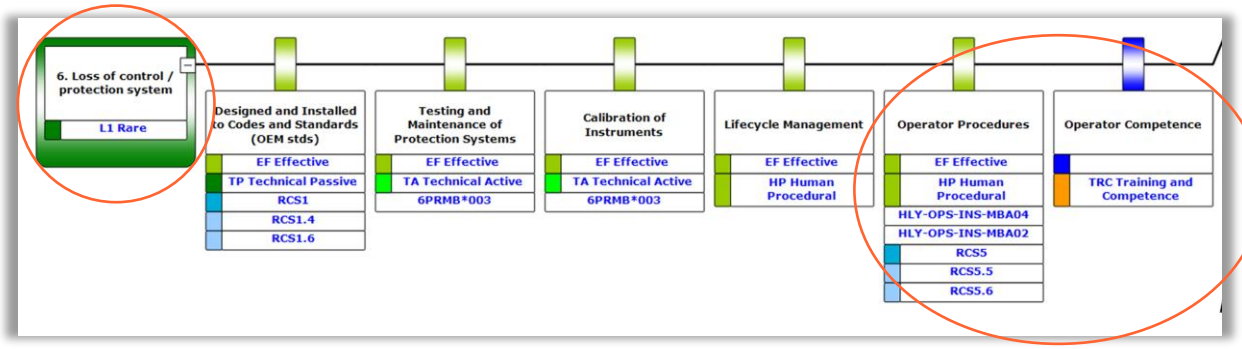

Figure 7: Process safety threat line

A validation of competency system should be put in place to ensure that staff who have been previously trained and deemed competent to work on safety critical tasks maintain their competency to do so, thus ensuring the process safety barrier remains effective.

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8.5.2 Validation of Competency for Safety-critical Tasks

Rather than implement a validation of competency system that checks full operator competency across all aspects of the operator role, StayLive recommends focusing on key safety-critical elements or high-risk procedures in which operator competency forms a barrier to a high-level event as well as emergency response scenarios.

A safety-critical element is defined as any part of the facility or its plant:

- that has the primary purpose of preventing or limiting the effect of a major incident, AND
- the failure of which could cause or substantially contribute to a major incident.

Best results will come from a validation of competency system that is targeted to key tasks with appropriately assessed criteria.

8.6 Validation of Competency Assessments

8.6.1 Assessment Frequency

The frequency of validation of competency assessment needs to be based on risk, plant complexity and frequency of operation, but the following situations may require a frequency review:

- legislation changes
- incidents
- changes in plant.

Currently, companies are generally opting for frequencies between two and three years.

8.6.2 Planning for Assessment

Validation of competency assessments can be conducted in the following ways:

- Whenever possible, gather naturally occurring evidence of competency during normal working practices; this is the most efficient approach.
- When events such as incident management occur, use the opportunity to observe and assess activities that are completed infrequently; alternatively, include validation of competency assessments in planned scenario, simulated testing or desktop exercises.

Before any assessments take place, employees should be informed of the assessment process, evidence required, topics that will be covered, and the feedback process.

8.6.3 Conducting Assessments

StayLive recommends a validation of competency assessment method based on natural observation. The following methods can be used for collection of supplementary evidence:

- verbal questioning to cover areas not covered through observation, eg, asking a candidate “what if….?”, and outlining a scenario that did not occur during the observation
- verbal questioning to confirm the candidate’s knowledge and understanding, as per the requirements of the standards
- observation of workplace evidence generated by the candidate
- attestations from other staff members who can confirm competence in an area not observed
- simulated or desktop activities set up to test competence in possible emergency situations (click here for more information about StayLive emergency response guidelines).

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8.6.4 Assessment Feedback

Following the assessment, employees should be advised which competencies they have successfully achieved, and which ones require further development and reassessment (in action plan format).

8.6.5 Competencies Requiring Further Development

For competencies that need further development, potential actions include:

- mentoring or coaching
- increased exposure to the task with support
- research activities or related projects
- any other appropriate method.

Until satisfactory reassessment is achieved, steps should be put in place to support the operator to complete the identified tasks under supervision.

8.7 Emergency Response

Due to the infrequent nature of emergency response and limited practical opportunities to maintain competence, StayLive recommends emergency response competency is assessed via a validation of competency process.

An emergency drill or desktop exercise should be held at the site for which the operations competency is required. The exercise should identify an aspect of emergency operating applicable to the site and its associated equipment that could occur in an emergency situation.

Emergency response drills or desktop scenarios can be completed as group or shift activities with frequencies and scale set relevant to the risk and complexity of the scenario. Shift teams who discuss, practise and familiarise themselves with infrequent emergency response scenarios will be far better placed to respond safely in an actual emergency.

Potential options for scenarios include:

- full site drill or scenario; this can also involve external emergency services
- desktop scenario stepping through the various tasks without physically completing them
- regular informal shift discussions or toolbox meetings focusing on a different scenario each time.

All emergency response exercises should be observed for accuracy of execution, and areas for improvement identified. Shortfalls or knowledge gaps should be addressed both in the short term and in the longer term with the update of operations training material.

8.8 Continuous Improvement

StayLive recommends that the operator validation of competency process is reviewed periodically to ensure that the process is continuously improved through:

- review of the actual validation of competency process
- extraction and sharing of intellectual property discovered during assessments to improve assessment criteria and operator consistency
- review of process safety systems to ensure barrier effectiveness and accuracy
- the observable decrease in operator-related events or incidents.

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