Group Award Specification for:

Professional Development Award (PDA) in Hydrogen: An Introduction for Technicians at SCQF level 7

Group Award Code: GT2L 47

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Contents

1 Introduction

This document was previously known as the arrangements document. The purpose of this document is to:

- assist centres to implement, deliver and manage the qualification.
- provide a guide for new staff involved in offering the qualification.
- inform course managers teaching staff, assessors, learners, employers and HEIs of the aims and purpose of the qualification.
- provide details of the range of learners the qualification is suitable for and progression opportunities.

This is the group award specification for the PDA in Hydrogen: An Introduction for Technicians at SCQF level 7.

Following detailed analysis of current and anticipated hydrogen activity in Scotland and Europe, it was concluded that there is reasonable expectation of hydrogen technologies making a significant contribution to the Scottish economy over the next 10 years. The PDA will provide a nationally certified course in hydrogen at practitioner level.

The PDA content will reflect the current skills gap in the hydrogen sector and is suitable for delivery in the workplace carrying a certification that is recognised across the industry. For this reason, it is essential that the detailed content of the course is developed by working closely with industry.

This PDA is intended to act as a vocational qualification to meet the workforce demands of the hydrogen industry. The group award title reflects the nature of the award and is linked to the skills required to develop good technical skills. There is a need to provide technician-level training in hydrogen technologies.

The PDA is made up of 24 SCQF credit points (3 SQA unit credits). While the exact time allocated to each unit is at the discretion of the centre, the notional design length is 40 hours.

The following diagram illustrates a potential typical progression route:

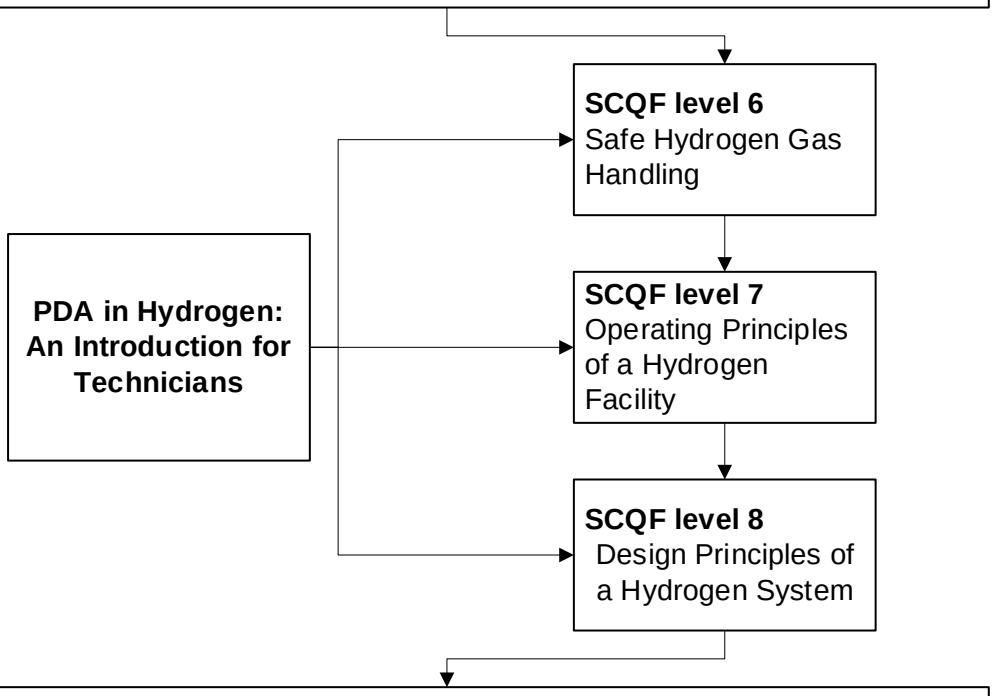
Recommended entry to unit

Formal entry qualifications
NC or HNC in a related discipline such as: Electrical Engineering, Mechanical Engineering, Engineering Systems, Manufacturing Engineering and Measurement and Control Engineering.

Higher level pass with supporting passes at National 5 or equivalent in appropriate subjects such as: Maths, English and Science.

SVQ in Engineering Discipline such as: Mechanical, Manufacturing and or Electrical Engineering

Industrial experience
Mature learners with suitable relevant work experience may be accepted for entry at the discretion of the centre.



Continuing development
Progress to further study at SCQF level 8 and 9
or
Enter to employment in the hydrogen industry

2 Qualification structure

The PDA in Hydrogen: An Introduction for Technicians is made up of 3 SQA unit credits. It comprises 24 SCQF credit points of spread evenly across SCQF level 6, 7 and 8. All three units are mandatory. A mapping of Core Skills development opportunities is available in Section 5.2. This is in line with SQA Principles of the design of Professional Development Awards.

2.1 Structure

To achieve this PDA, learners must complete three mandatory units.

Mandatory units

Unit code	Unit title	SCQF level	SCQF credit points	SQA credit
J5SJ 33	Safe Hydrogen Gas Handling	6	8	1
J64P 34*	Operating Principles of an Electrolytic Hydrogen Facility	7	8	1
J5SL 35	Design Principles of a Hydrogen System	8	8	1

*Refer to 'History of Changes'

3 Aims of the qualification

The principal aim of this PDA is to provide learners with the opportunity to develop the skills and knowledge necessary to work in the growing Scottish and European hydrogen industry. The PDA seeks to instil essential knowledge pertaining to the use of hydrogen as an energy source and storage medium alongside practical skills for safely and effectively working in hydrogen industrial environments. The PDA aims to be an industry recognised course, certified by SQA, which offers technician-level training in hydrogen technologies and to provide learners with the opportunity to develop current and future skills to meet the needs of industry.

In addition, the award is designed with continuous professional development in mind such that the knowledge and skills instilled in this PDA are formally recognised as progressive SCQF levels thus providing a clear pathway to further articulation routes into appropriate HNC/D engineering courses and subsequently to degree opportunities.

The aims of the qualification have been split into general aims and specific aims listed in the following sub-sections.

3.1 General aims of the qualification

1 To provide opportunities for learners to develop the necessary competencies desirable to employers throughout the growing Scottish and European hydrogen sector.
2 To develop key skills for employability while building on previously acquired transferable skills which could allow progression within the SCQF (Scottish Credit and Qualification Framework) or lead to employment.
3 To develop skills in study, research, and analysis, and to improve the learner's ability to define and solve problems.

4 To develop the learner's skills in working with others including aspects such as: communication, flexibility, judgement and decision making, integrity, motivation, and cooperation.
5 To provide an award that, on successful completion, provides learners with opportunities to develop components of core skills in *Communication*, *Numeracy*, *Information and Communication Technology*, *Problem Solving*, and *Working with Others*.
6 To instil in learners a sense of personal responsibility for individual learning and progression.

3.2 Specific aims of the qualification

7 To provide a range of specialised knowledge and skills in disciplines relevant to employment within the hydrogen sector.
8 To provide opportunities for learners to develop a SQA certified set of hydrogen knowledge and skills for the purpose of progression into further academic study — either before embarking on a career or in parallel to it.

4 Recommended entry to the qualification

Entry to this qualification is at the discretion of the centre. The following information on prior knowledge, skills, experience, or qualifications that provide suitable preparation for this qualification has been provided by the Qualification Design Team as guidance only.

Learners would benefit from having attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience.

Formal qualifications considered suitable for access to the PDA in Hydrogen: An Introduction for Technicians

Learners who enter with at least one of the following qualifications are likely to benefit more readily from the programme:

- NC or HNC in a related discipline, these could include but are not limited to Electrical Engineering, Mechanical Engineering, Engineering Systems, Manufacturing Engineering and Measurement and Control Engineering.
- At least one Higher level pass, with appropriate supporting passes at National 5 or equivalent in appropriate subjects: desirably this would include Maths, English, and or a Science subject.
- SVQ in an Engineering Discipline, these could include but are not limited to Mechanical, Manufacturing or Electrical Engineering.

Work experience

Mature learners with suitable relevant work experience may be accepted for entry, or advanced entry; provided the enrolling centre believes that the learner is likely to benefit from undertaking the qualifications. Centres may wish to use Core Skills profiling to assist them in this process.

English as a second language

The unit *Workplace Communication in English* (or some other support mechanism) is available to support those learners for whom English is an additional language.

4.1 Core Skills entry profile

The Core Skill entry profile provides a summary of the associated assessment activities that exemplify why a particular level has been recommended for this qualification. The information would be used to identify if additional learning support needs to be put in place for learners whose Core Skills profile is below the recommended entry level or whether learners should be encouraged to do an alternative level or learning programme.

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Communication	5	Good communication skills will be required for learners doing this qualification as they will need to research, analyse, report and present technical data and documentation.
Numeracy	5	Good numerical skills will be required for learners doing this qualification as they will need to complete a range of calculation tasks.
Information and Communication Technology (ICT)	5	Good ICT skills are core to this qualification. Learners will need a sound understanding of basic ICT as the foundation to use systems to search online material for research purposes. In addition, there is the opportunity to present learning materials and assessments via an e-learning portal — at the discretion of the centre.
Problem Solving	5	Critical thinking, planning and organising, and reviewing and evaluation are fundamental to all elements of this qualification.
Working with Others	5	Working as part of a team co-operatively is essential when progressing to industry. There are several opportunities throughout this award for working with others to take place.

5 Additional benefits of the qualification in meeting employer needs

This qualification was designed to meet a specific purpose and what follows are details on how that purpose has been met through mapping of the units to the aims of the qualification. Through meeting the aims, additional value has been achieved by linking the unit standards with those defined in national occupational standards and/or trade/professional body requirements. In addition, significant opportunities exist for learners to develop the more generic skill, known as Core Skills through doing this qualification.

5.1 Mapping of qualification aims to units

Unit code	Unit title	Aims							
		1	2	3	4	5	6	7	8
J5SJ 33	Safe Hydrogen Gas Handling	X	X	X	X	X	X	X	X
J64P 34*	Operating Principles of an Electrolytic Hydrogen Facility	X	X	X	X	X	X	X	X
J5SL 35	Design Principles of a Hydrogen System	X	X	X	X	X	X	X	X

*Refer to 'History of Changes'

5.2 Mapping of Core Skills development opportunities across the qualification

Unit code	Unit title	Communication			Numeracy		ICT		Problem Solving			Working with Others	
		Written (Reading)	Written (Writing)	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
J5SJ 33	Safe Hydrogen Gas Handling	S5	S5		S5	S5	S5		S5		S5	S5	S5
J64P 34*	Operating Principles of an Electrolytic Hydrogen Facility	S6	S6		S6		S6		S6		S6	S6	S6
J5SL 35	Design Principles of a Hydrogen System	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6

E — Embedded Core Skill
S — Signposted Core Skill

5.3 Assessment strategy for the qualification

In the majority of units, theory based outcomes are assessed holistically or on a sample basis by means of an end of unit open-book, supervised and timed assessment conditions. Practical outcomes are evidenced in a variety of forms; see individual unit assessment specifications below.

Unit	**Assessment**
Safe Hydrogen Gas Handling	The type of evidence suitable to demonstrate proficiency in outcomes 1 and 2 shall take the form of written and/or oral recorded evidence under open-book, supervised and timed assessment conditions. This assessment could take the form of one extended (multi-part) examination in which Outcome 1 could be assessed via calculation exercises and Outcome 2 could be assessed through a set of multiple-choice questions. The type of evidence suitable to demonstrate proficiency in Outcomes 3 and 4 shall take the form of product evidence under open-book and unseen assessment conditions. Outcome 3 could be assessed by the submission of a short report identifying potential hazards, necessary PPE, and test procedures to ensure safety when working with hydrogen in a particular complex industrial environment. Outcome 4 could be assessed by the submission of a second short report outlining correct manual handling procedures and identifying the appropriate use of select regulators.
Operating Principles of a Hydrogen Facility	The type of evidence suitable to demonstrate proficiency in Outcomes 1 and 2 shall take the form of written and/or oral recorded evidence under open-book, supervised and timed assessment conditions. This assessment could take the form of one extended (multi-part) examination in which outcomes 1 and 2 shall each be assessed via calculation exercises, short written response form questions and multiple-choice form questions. The type of evidence suitable to demonstrate proficiency in Outcomes 3 and 4 shall take the form of product evidence under open-book and unseen assessment conditions. Outcome 3 could be assessed by the submission of a short report describing correct procedures for maintenance, installation and operation of electrolysis plant and fuel cell systems. Outcome 4 could be assessed by the submission of a second short report describing correct procedures for taking measurements from a hydrogen facility to assess system operation and analyse performance.

Unit	Assessment
Design Principles of a Hydrogen System	The type of evidence suitable to demonstrate proficiency in Outcomes 1, 2 and 3 shall take the form of written and/or oral recorded evidence under open-book, supervised and timed assessment conditions. This assessment could take the form of one extended (multi-part) examination in which all Outcomes could be assessed (potentially employing sampling to demonstrate general competency) via calculation exercises, short written response form questions and multiple-choice form questions. The type of evidence suitable to demonstrate proficiency in Outcome 4 shall take the form of product evidence under open-book and unseen assessment conditions. In Outcome 4, learners could be tasked with designing a hydrogen-based system that offers a solution to the specific problem. This task could take the form an individual project-based coursework exercise, in which learners will be expected to undertake a degree of self-directed learning and research. This Outcome could be assessed in the form of a concise report presenting the learner's design solution, which shall demonstrate that they have considered each of the key learning outcomes.

6 Guidance on approaches to delivery and assessment

The PDA in Hydrogen: An Introduction for Technicians aims to give learners the opportunity to develop the skills and knowledge necessary to work in the growing Scottish and European hydrogen industry.

The qualification has relevant unit specifications that provide detailed guidance on the content, delivery, and assessment of the unit.

For some outcomes, a distance learning delivery mode would be possible provided adequate materials, learner support and assessment facilities. Centres should note however that all units of this PDA include some aspects necessitating practical activities and that the first two units, in particular, require that these activities be conducted in an industrial environment (or laboratories in which these environments are emulated). Centres should also note that these practical activities must take place under supervised conditions.

Centres will define which order the units are undertaken based on learner recruitment patterns, mode of delivery, resource implications, and logical progression.

Assessment Support Packs (ASPs) are available for some of the units included in this qualification. Centres can use the ASPs for assessment purposes as long as they are kept secure. ASPs may be used by centres as a guide and/or template for producing locally devised assessments.

6.1 Sequencing/integration of units

The structure of the PDA allows for flexibility in the mode of delivery and lends itself to a wide range of delivery mechanisms including formal teaching, use of case studies, group work, tutorial sessions, and practical activities. A number of units necessitate a specific delivery/assessment approach, and these are indicated in the unit descriptors.

Sequencing of delivery shall be at the discretion of the centre; a suggested sequence is outlined below:

PDA in Hydrogen: An Introduction for Technicians — Suggested sequencing of delivery

Semester 1			**Semester 2**		
Unit code	**Unit title**	**SQA credit**	**Unit code**	**Unit title**	**SQA credit**
J5SJ 33	Safe Hydrogen Gas Handling	1	J5SL 35	Design Principles of a Hydrogen System	1
J64P 34*	Operating Principles of an Electrolytic Hydrogen Facility	1			
Total SQA credits		**2**	**Total SQA credits**		**1**

*Refer to ‘History of Changes’

The unit in *Safe Hydrogen Gas Handling* (SCQF level 6) provides learners with fundamental knowledge and skills relevant to the hydrogen industry and in doing so acts as an opportunity to support learners who have limited prior knowledge of hydrogen. It is therefore recommended that this unit be sequenced first in the delivery as it will support subsequent units in the group award. The suggested second unit, *Operating Principles of a Hydrogen Facility* (SCQF level 7), expands upon the fundamentals and acts to broaden a learner's knowledge base. The knowledge and skills contained within these first two suggested subsequently supports learners when undertaking the design project included in the unit *Design Principles of a Hydrogen System* (SCQF level 8), which is suggested to be sequenced as the final unit of the PDA.

6.2 Recognition of prior learning

SQA recognises that learners gain knowledge and skills acquired through formal, non-formal and informal learning contexts.

In some instances, a full group award may be achieved through the recognition of prior learning. However, it is unlikely that a learner would have the appropriate prior learning and experience to meet all the requirements of a full group award.

The recognition of prior learning may **not** be used as a method of assessing in the following types of units and assessments:

- HN Graded Units
- Course and/or external assessments
- Other integrative assessment units (which may or not be graded)
- Certain types of assessment instruments where the standard may be compromised by not using the same assessment method outlined in the unit
- Where there is an existing requirement for a licence to practice
- Where there are specific health and safety requirements
- Where there are regulatory, professional, or other statutory requirements
- Where otherwise specified in an assessment strategy

More information and guidance on the *Recognition of Prior Learning* (RPL) may be found on our website **www.sqa.org.uk**.

The following sub-sections outline how existing SQA unit(s) may contribute to this group award. Additionally, they also outline how this group award may be recognised for professional and articulation purposes.

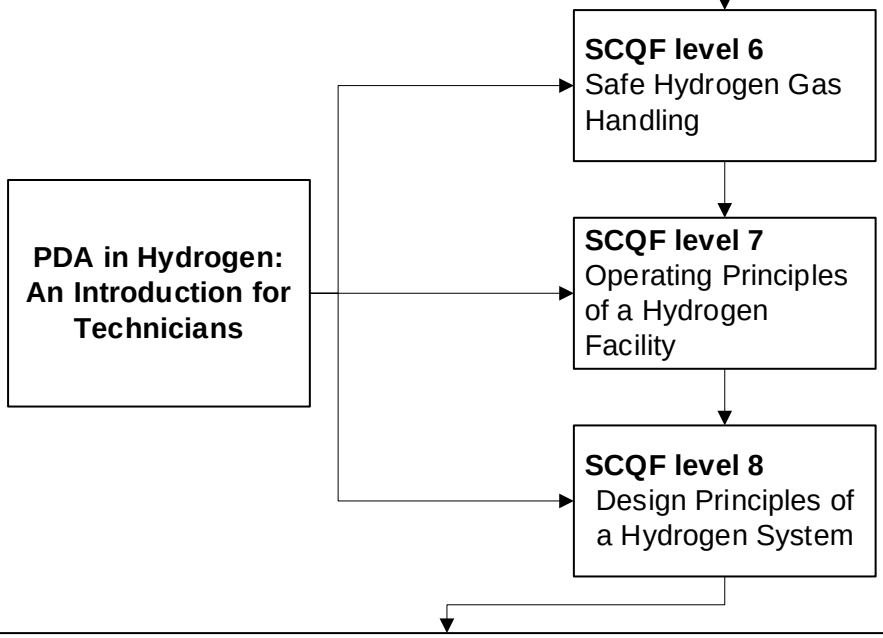
6.2.1 Articulation and/or progression

Formal entry qualifications
NC or HNC in a related discipline such as: Electrical Engineering, Mechanical Engineering, Engineering Systems, Manufacturing Engineering and Measurement and Control Engineering.

Higher level pass with supporting passes at National 5 or equivalent in appropriate subjects such as: Maths, English and Science.

SVQ in Engineering Discipline such as: Mechanical, Manufacturing and or Electrical Engineering

Industrial experience
Mature learners with suitable relevant work experience may be accepted for entry at the discretion of the centre.



Continuing development
Progress to further study at SCQF level 8 and 9
or
Enter to employment in the hydrogen industry

6.3 Opportunities for e-assessment

E-assessment may be appropriate for some assessments in the units comprising this group award. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software.

Centres that wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**

6.4 Support materials

A **list of existing ASPs** is available to view on SQA's website.

6.5 Resource requirements

Delivering centres will require appropriate engineering teaching laboratories and technical support as well as appropriate practical resources to support the delivery of the practical elements of the PDA in Hydrogen: An Introduction for Technicians. Centres should note the necessity for specific equipment to adequately emulate a hydrogen industrial environment for delivery of Safe *Hydrogen Gas Handling* (SCQF level 6) and *Operating Principles of a Hydrogen Facility* (SCQF level 7). These requirements are outlined in the course descriptor documents of these units.

Centres must ensure that specific requirements in terms of documents, texts, and IT resources to support the learning processes within the PDA are met. All staff delivering the PDA in Hydrogen: An Introduction for Technicians must hold a qualification appropriate to the unit(s) delivered.

7 General information for centres

Equality and inclusion

The unit specifications making up this group award have been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners will be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

Internal and external verification

All assessments used within this/these qualification(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* **(www.sqa.org.uk/GuideToAssessment)**.

8 Glossary of terms

Embedded Core Skills: is where the assessment evidence for the unit also includes full evidence for complete Core Skill or Core Skill components. A learner successfully completing the unit will be automatically certificated for the Core Skill. (This depends on the unit having been successfully audited and validated for Core Skills certification.)

Finish date: The end of a group award's lapsing period is known as the finish date. After the finish date, the group award will no longer be live and the following applies:

- candidates may not be entered for the group award
- the group award will continue to exist only as an archive record on the Awards Processing System (APS)

Lapsing date: When a group award is entered into its lapsing period, the following will apply:

- the group award will be deleted from the relevant catalogue
- the group award specification will remain until the qualification reaches its finish date at which point it will be removed from SQA's website and archived
- no new centres may be approved to offer the group award
- centres should only enter candidates whom they expect to complete the group award during the defined lapsing period

SQA credit value: The credit value allocated to a unit gives an indication of the contribution the unit makes to an SQA group award. An SQA credit value of 1 given to an SQA unit represents approximately 40 hours of programmed learning, teaching and assessment.

SCQF: The Scottish Credit and Qualification Framework (SCQF) provides the national common framework for describing all relevant programmes of learning and qualifications in Scotland. SCQF terminology is used throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at **www.scqf.org.uk**.

SCQF credit points: SCQF credit points provide a means of describing and comparing the amount of learning that is required to complete a qualification at a given level of the Framework. One National Unit credit is equivalent to 6 SCQF credit points. One National Unit credit at Advanced Higher and one Higher National Unit credit (irrespective of level) is equivalent to 8 SCQF credit points.

SCQF levels: The level a qualification is assigned within the framework is an indication of how hard it is to achieve. The SCQF covers 12 levels of learning. HNCs and HNDs are available at SCQF levels 7 and 8 respectively. Higher National Units will normally be at levels 6–9 and graded units will be at level 7 and 8. National Qualification Group Awards are available at SCQF levels 2–6 and will normally be made up of National Units which are available from SCQF levels 2–7.

Subject unit: Subject units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Signposted Core Skills: refers to opportunities to develop Core Skills arise in learning and teaching but are not automatically certificated.

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. This document is the latest version and incorporates the changes summarised below. Centres are advised to check SQA's APS Navigator to confirm they are using the up to date qualification structure.

NOTE: Where a unit is revised by another unit:

- No new centres may be approved to offer the unit which has been revised.
- Centres should only enter candidates for the unit which has been revised where they are expected to complete the unit before its finish date.

Version Number	Description	Date
02	*Operating Principles of a Hydrogen Facility* J5SK 34 has been replaced *by Operating Principles of an Electrolytic Hydrogen Facility* J64P 34. J5SK 34 finished on 23/11/2021.	30/03/22

Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of this qualification.

9 General information for learners

This section will help you decide whether this is the qualification for you by explaining what the qualification is about, what you should know or be able to do before you start, what you will need to do during the qualification and opportunities for further learning and employment.

Following detailed analysis of current and anticipated hydrogen activity in Scotland and Europe, it was concluded that there is reasonable expectation of hydrogen technologies making a significant contribution to the Scottish economy over the next 10 years.

In order to provide you with opportunities for employment in this industry and/or further study of hydrogen technologies, this PDA principally aims to:

- Instil in you the fundamental knowledge and skills necessary to work with hydrogen as a fuel source or energy storage medium.
- Provide you with knowledge of the safety risks associated with working with hydrogen and understanding of how to conduct an adequate risk assessment.
- Equip you with knowledge and experience of correct manual handling procedures particular to working with hydrogen.
- Equip you with knowledge and experience in the operation, service, and maintenance of various plant items common to hydrogen sites.
- Provide you with an understanding of hydrogen's potential role in creating clean energy solutions.
- Provide you with the specialist knowledge required to design realistic hydrogen-based energy solutions.

The PDA is considered suitable for anyone looking to enhance their skills in hydrogen technologies to meet the requirements of the growing Scottish and European hydrogen industry. It is considered to be particularly beneficial for those who already have a background in engineering disciplines such as: electrical engineering, mechanical engineering, systems engineering, manufacturing or measurement and control systems.

To achieve the PDA in Hydrogen at SCQF level 7 you will be required to complete three mandatory units titled:

- Safe Hydrogen Gas Handling SCQF level 6
- Operating Principles of an Electrolytic Hydrogen Facility SCQF level 7
- Design Principles of a Hydrogen System SCQF level 8