



PROF / TRAC

Check my nZEBskills!



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 649473

Brussels, April 2018

Introduction

Social and affordable housing managers face several challenges to lift the number of their dwellings towards Nearly Zero Energy Buildings-levels (nZEB). The upgrading of the energy performance of (new and existing) housing¹, needs to go hand in hand with affordable housing costs and optimal comfort-level for their residents.

The financial room for manoeuvre is restricted. It requires special skills from housing professionals and their providers to design and execute well-balanced nZEB projects from a technical, financial and social point of view.

PROF/TRAC offers several tools to help organizations to check if they all have the adequate set of skills are on board to take on the nZEB challenges. This is not limited to the skills managed internally. The level of nZEB-skills of providers is just as important for successful nZEB projects.

Such key questions also guide strategic decisions about your future HR-selection, skills training, outsourcing policies and supply chain management. This briefing explains how PROF/TRAC helps housing providers to manage the right set of nZEB-skills.

PROF/TRAC tools

The construction, renovation and management of Nearly Zero Energy Buildings require a large contribution from all the actors involved, including the main contractor, the housing manager, the architect, the construction company and the firms responsible for the mechanical and electrical engineering.

The requirements for nZEB require new collaboration methods: innovative design processes and technologies based on an integrated design approach and multi-disciplinary work teams. Still, this approach is not yet common, as the housing, building and installation sectors still work in a fragmented process.

PROF/TRAC observed that two of the major barriers to the transformation of the building stock were 1) the limited knowledge and skills in energy efficient buildings design and nZEB principles and 2) the lack of collaboration between the different disciplines and professionals.

To resolve these barriers towards the nZEB challenges, PROF / TRAC offers **four main tools**.

nZEB skills and qualification scheme

To ensure successful design and construction process of nZEB, PROF/TRAC offers a European Qualification Scheme on nZEB skills. This scheme was developed based on a set of harmonized work fields; the definition of nZEB skills and skills levels; and a common description of qualifications across Europe.

First, to define the harmonized work fields, PROF/TRAC groups several professions to identify seven main work fields involved in the nZEB delivery chain (figure 1).

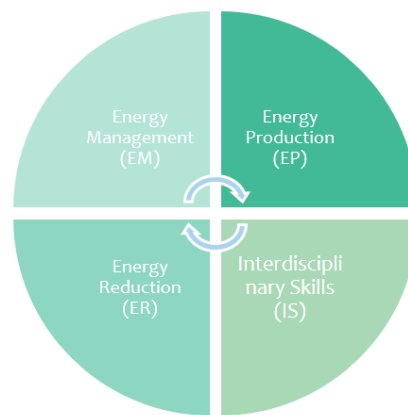
¹ According to local, national and EU requirements (e.g. Energy Performance of Buildings Directive or Energy Efficiency Directive)

Figure 1 Work fields and reference professions

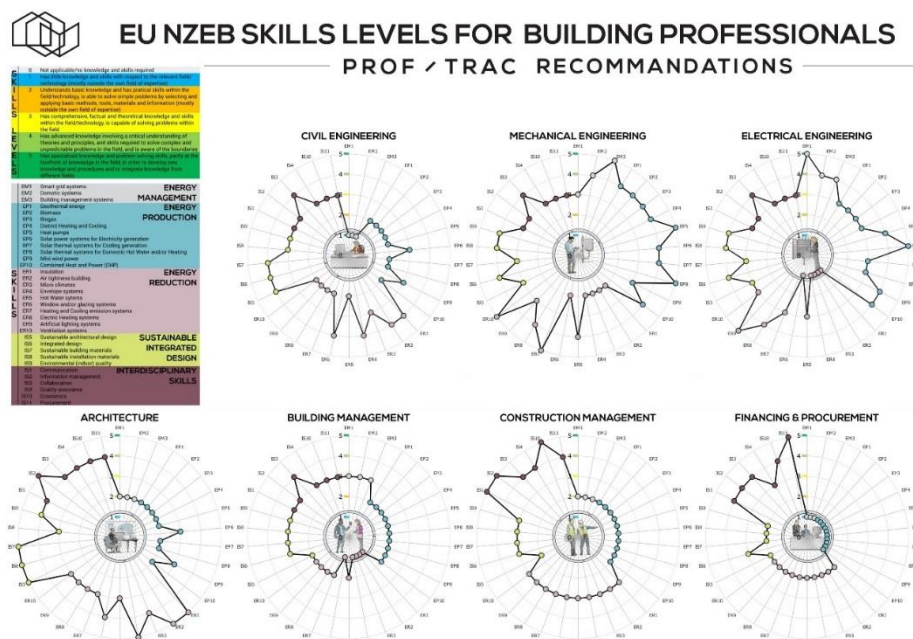
TECHNOLOGY AND INTERDISCIPLINARY SKILLS PER WORK FIELD							
WORK FIELD	ARCHITECTURE	CIVIL ENGINEERING	ELECTRICAL ENGINEERING	MECHANICAL ENGINEERING	BUILDING MANAGEMENT	CONSTRUCTION MANAGEMENT	FINANCING & PROCUREMENT
Reference professions	Architect	Civil Engineer	Electrical Engineer	Mechanical Engineer	Facility Manager	Project Manager	Procurer
		Construction Engineer	ICT Engineer	Building Automation Engineer	Technical Energy Engineer	Cost Engineer	Project Developer
		Structural Engineer		Energy Engineer	Operator	Quality Assurance	

The four areas of expertise have been selected. PROF/TRAC assumes that each (white-collar) professional involved in nZEB design and construction will necessarily have at least one of these skills. The more skilled the professionals, the more successful the nZEB design. (Figure 2)

Figure 2 Four main areas of nZEB expertise



Each of these is then sub-divided based on a comprehensive set of nZEB technologies and interdisciplinary skills. In total the skill level needed for more than 40 nZEB technologies can be assessed for each of the 7 main work fields. This results in more than 280 (40 x 7) combinations of recommended minimum skill level per work field for each of the previously listed nZEB skills.



(Figure 3 Recommended minimum nZEB skills levels per work field | click on the image for more information)

Figure 3 shows one possible way to visualize PROF/TRAC skills level recommendations per work field. The summary table ([link to pdf](#)) shows the overview of minimum skill levels per work field². Skills levels range from 1 to 5, where 5 is the highest degree of knowledge. (figure 4)

Figure 4 Definition of skills levels

0	Not applicable / no knowledge and skills required
1	Has little knowledge and skills with respect to the relevant field / technology (mostly <i>outside</i> the own field of expertise). Understands basic principles and is able to take part in project team discussions
2	Understands basic knowledge and has practical skills within the field / technology, is able to solve simple problems by selecting and applying basic methods, tools, materials and information (mostly <i>outside</i> the own field of expertise)
3	Has comprehensive, factual and theoretical knowledge and skills within the field / technology, is capable of solving standard problems within the field
4	Has advanced knowledge involving a critical understanding of theories and principles and skills, required to solve complex and unpredictable problems in the field and is aware of the boundaries
5	Has specialized knowledge and problem-solving skills, partly at the forefront of knowledge in the field, in order to develop new knowledge and procedures and to integrate knowledge from different fields

PROF/TRAC converted the Qualification Scheme in a powerful mapping tool that housing organizations can use to assess their skills gap in nZEB. National federations can also use the tool for information purposes or as an assessment tool to check the level of nZEB skills at national level. Not only to look for critical skills gaps in their own sector but also to check for any gaps in the supply chain. The scheme can also be used to inform European programmes, such as Erasmus+, about the need to solve existing gaps under professionals to reach nZEB targets.

[Download the PROF/TRAC Qualification Scheme here](#)

How to use the Qualification Scheme Excel file:

- Sheet “Overview” provides the general description of skills levels and nZEB skills
- In sheet “EU minimum skill levels” the skills levels recommendations are given per work field and per technology/skill.
- In sheets “EM1” to “IS10”, each technology/skill is detailed in terms of qualifications required. Depending on the skills level under analysis (from 1 to 5), a qualification may or may not be required.

For example, the Qualification Scheme shows that architects have a recommended skills level 2 on smart grid systems. By referring to skills level 2 on the tab for EM1 (smart grid systems), in this case it is possible to derive that architects need at least to grasp the following skills:

- *General knowledge and a holistic view on smart grids and understanding of its contribution to energy saving.*
- *Manage and audit contractors on site during realisation, based on information given by the designer.*

² NOTE: The current list of technologies, skills and qualifications is the result of the consultation with nZEB experts within PROF/TRAC consortium. With the disclosure of this qualification scheme to other experts and considering the fast technological progress of the energy efficiency market, this list is expected to extend. The recommendations of PROF/TRAC can be adapted to the national level situation and needs, based on the PROF/TRAC skills mapping methodology with local experts.

Figure 5 Example of minimal skills of architects on smart grid systems

nZEB skills levels per smart grid systems per work field (excerpt of Table 5)

	Work field	Architecture	Civil Engineering	Electrical Engineering	Mechanical Engineering	Building Management	Construction Management	Financing and Procurement
		Architect	Civil Engineer	Electrical Engineer	Mechanical Engineer	Facility Manager	Project Manager	Procurer
	Reference Professions		Construction Engineer	ICT Engineer	Building Automation Eng.	Technical Energy Engineer	Cost Engineer	Project Developer
			Structural Engineer		Energy Engineer	Operator	Quality Assurance	
TECHNOLOGY, INTERDISCIPLINARY SKILLS AND PROFESSIONS								
M	ENERGY MANAGEMENT							
EM1	Smart grid systems	2	1	5	3	3	2	1

nZEB competences about smart grid systems per skills levels

EM1	Smart grid systems	Electronic digital control of production, distribution and use of electricity, information management of the components.				
Project phase	Detailed description of skills	for skill level(s)				
(If applicable)		1	2	3	4	5
General	Has general knowledge and a holistic view on smart grids and buildings' energy profiles, understanding of its contribution to energy performance					
General	Can provide the (smart) grid manager with basic information on buildings' energy profiles					
General	Can think in a holistic way concerning energy demand, energy supply, storage and is able to make trade-offs					
Pre-design	Can perform a feasibility study to determine the basic concept within the project, based on energy saving contribution, costs, restrictions, etc.					
Pre-design	Can perform energy simulations in order to define building energy profiles (such as heat load duration curves)					
Pre-design	Can define the energy profile of the building, i.e. the energy demand profiles, energy supply profiles, storage (in relation with heat pumps), based on input from team members.					
Design	Can design and calculate the smart grid system, based on heat load duration curves, energy simulations etc.					
Tender	Can specify and describe the smart grid system in a tender contract, in a way that ensures the contribution to energy saving is realised.					
Realisation	Can manage, instruct and audit contractors on site during the realisation of a smart grid system, based on information given in the tender documents and given by the designer.					
Commissioning	Can commission a smart grid system on its functionality and quality, and determine whether the system operates as planned. Make sure the foreseen contribution to energy saving is realised.					
Use & Maintain	Monitor and control of the smart grid system on critical parameters, in order to guarantee the designed performance during life cycle. Takes action on abnormalities and adjust settings to ensure optimal operation.					

SOFT SKILLS & SMART CONTRACTING

Looking at housing providers and their fields of work such as Financing, Procurement and Construction Management, it is noticeable that the Qualification Scheme attributes the most weight to the category of INTERDISCIPLINARY SKILLS. This confirms the efforts of social, public and cooperative housing providers to focus more and more on smart contracting methods to challenge the market with the best possible solutions in terms of costs and quality over time.

Any effective long-term energy efficiency strategy in the housing sector should therefore include steps to improve the building renovation supply chain. The construction has not delivered the same productivity gains as other economic sectors. The current energy transition might shake

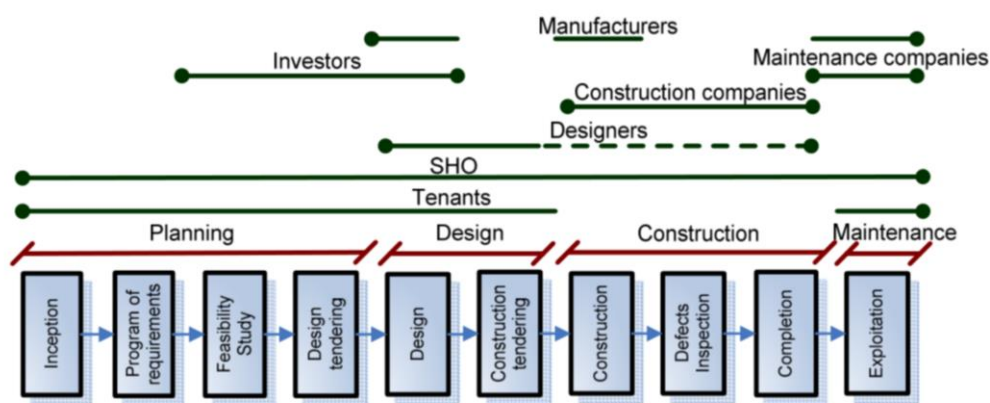
things up, but we should not forget that the construction sector is one of the least innovative sectors³.

To step up the speed towards nZEB, innovation is a key factor. Not only to develop new products and processes, but also to upgrade the skills needed along the whole chain: from formulating the demand to the supply in the construction and installations sectors.

From price selection to smart contracting

The process used by the social and affordable housing organisation to organise the design, works and subsequent maintenance for a project should be envisaged differently in the future. The idea is that a smarter commissioning should break down the silos and force the supply chain in the construction and installation sector to better cooperate. This means a switch to more integrated contracts, for instance Design-Build-Maintain contracts⁴.

Figure 6 Social Housing Organizations (SHO) are involved in each phase of the cycle (Source: Shelter project)



As mentioned, a detailed involvement by housing providers in setting detailed specifications of the construction or renovation process might be costly and kill innovation. On the contrary, to create the most value and innovations requires a balance between steering for a maximum end-value and not imposing too much specifications.

More integrated design and supply through better collaboration

One of the relevant conclusions of PROF/TRAC, is that there are still important gaps in the knowledge and skills of professionals in the supply of nZEB. E.g. in the Netherlands it was observed that many construction and installation companies do not yet feel the need to change to sustainable technologies and keep on offering natural gas heating or double-glazing windows without informing their clients about new possibilities. Such signals are echoed in the social and affordable housing sector and PROF/TRAC showed some of the reasons:

- A lack of tradition for **integrated design processes**;

³ McKinsey Global Institute, *A blueprint for addressing the global affordable housing challenge*, October 2014

⁴ The social housing provider tenders the design, construction works and maintenance works in a single contract. The inclusion of the maintenance company in a single contract with the design and the construction, offers the possibility to develop a guarantee of performance after the works. It also forces the supply chain to integrate solutions and work in a more cooperative and efficient manner.

- Low readiness for adoption of **new collaborative, organizational and educational models**.
- The desire for **interdisciplinary design** is blocked by market and financial interests which govern **a mostly linear, instead of integrated design approach**;

This proves that more focus on collaboration and integrated design has the potential to lower costs and increase the end-value of nZEB concepts for social landlords and their end-users.

Further steps are needed to improve the skills needed for professionals to be able to grasp these methods. It shows the need to improve EVT (Education and Vocational Training), LLL (Life Long Learning) and the requirements for continuing professional development (CPD).

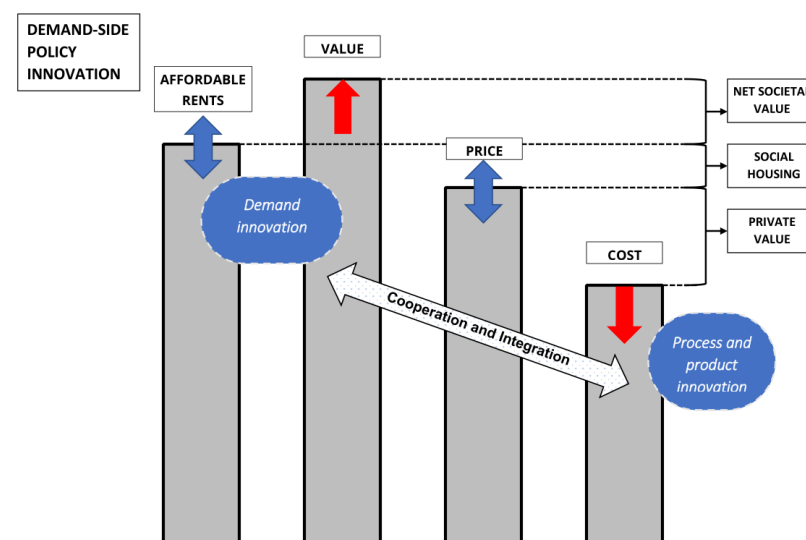
Demand-side innovations

Organizing tenders to get the lowest price might not result in the best value. Therefore, EU public procurement rules – with all their shortcomings⁵ – include selections based on MEAT (Most economically advantageous tenders).

Housing providers are aware that their contracting policies can generate, or prevent, innovations. To create a better offer of nZEB concepts, they can integrate contracts, review their price and performance incentives and use their weight to push for more investments in innovative nZEB concepts (e.g. through demand bundling or mass procurement). Housing providers can ask for: 1) integrated designs and multi-disciplinary collaborations 2) building teams composed of companies with the right nZEB skills 3) companies that have active training and development policies focused on nZEB skills.

Such demand side innovations can contribute to improve nZEB projects and increase the cost-efficiency and the overall societal value for all actors. (see figure 7)

Figure 7 Possible societal benefits of supply chain management and contracting innovations



⁵ Previous EU projects, like Shelter, showed the difficulty for public housing providers in some European countries to use Design-renovate-maintain contracts under EU public procurement

rules  <https://bit.ly/2KjYoof>

Multi-skills specialists

PROF/TRAC made clear that current technological development lead to a growing diversity in specialisms and a growing need of in-depth specialists (I-shaped professional). On the other hand, these specialists must be able to connect with specialists from other fields and non-technological disciplines, to work together and see the bigger picture (Generalist). Thus, a new type of engineer is needed: the T-shaped professional, which need to combine both.

If we look at the social and affordable housing sector these changes also influence the nature of the relationships with their suppliers. Probably, a parallel effort needs to be made on the demand side for nZEB to increase collaboration efforts and integrated offers. More confidence that information and data are made available and that the benefits are shared equally.

This is only possible if professionals from housing associations have matching skills. They need to be aware of their partners' skills and incentives to organize and define the risk allocation and the right incentives between the partners of the nZEB project. This should inform the most suitable type of contract for each project.

For Energy performance contracts in renovation works often the choice is Engineering, Build and Maintain (EBM) because the exploitation phase is crucial for the payback of the investment. Clear goals need to be set: e.g.: the energy performance (theoretic or real), budgetary impact for tenants or owners, and payback-periods.



In some nZEB projects the execution/implementation stage of the designed solutions did not bring the expected results because there was not control if the settings and functions were still correct or needed to be re-calibrated during the operation of active systems: mechanical ventilation system, solar-thermal panels, heat pumps with ventilation exhaust air heat recovery, PV panels and illumination control. Integrated contract can include regular measurements and check-ups.

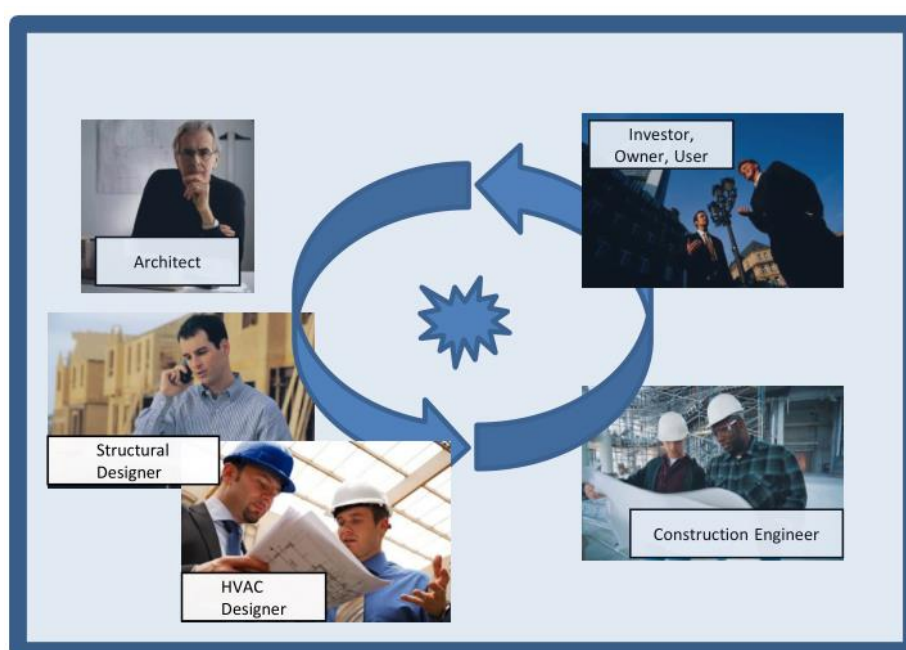
Working on nZEB projects will require new skills from social and affordable housing professionals: a leading role in setting-up, working and renewing its cross-disciplinary nZEB project team; knowledge about integrated designs, best value-approaches and possess interdisciplinary skills. They will need to be able to define and formulate the end needs and the value to be achieved.

A good example comes from the Spanish Association of Public Social and affordable housing and Land Providers (AVS) and IVE that designed an online course on energy efficiency renovation and financing with four modules for Spanish social and affordable housing

practitioners. Federcasa, the Italian Federation of Public Housing Providers, with the support of CasaQualità, also developed an advanced module on implementation and management of social and affordable housing projects to nearly zero energy for Italian social and affordable housing practitioners.

These findings are closely related to the recommendations done in an earlier EU project (SHELTER) where social and affordable housing organizations were directly involved:

- **Involve construction and maintenance companies during the design phase** in energy renovation projects.
- Define lists of legal and recommended **award criteria** for energy renovation projects.
- Make use of **performance-based specifications**.
- Define **separate contracts** for specific works in energy renovation projects.
- Implement **professional certificates** at European level.
- Implement actions that make a **direct link for the tenants between their behavior and the energy bill**.



Improve your nZEB skills

If the examination of the supply chain (at macro or individual level) reveals any lacking skills that poses a barrier to nZEB activities, organizations and their professional can access a number of tools to upgrade nZEB skills.

Train-the-Trainers

Free on-line courses allow building professionals to update their skills with an advanced training in nZEB design. The course consists of 8 one-hour online sessions, during which participants are acquainted with educational materials, different investigative and training methods, and latest knowledge sources on nZEB design.

After having completed the course and submitted each lecture's tests, the participants can become Certified PROF/TRAC Training Providers. Certified PROF/TRAC Training Providers are trained trainers providing PROF/TRAC trainings in their home countries. Sessions of the course,

training providers, lecturers and previous Train-the-trainer courses are accessible through the PROF/TRAC website:



<http://proftrac.eu/follow-the-online-ttt-course/the-proftrac-train-the-trainers-course.html>

Training Material Repository

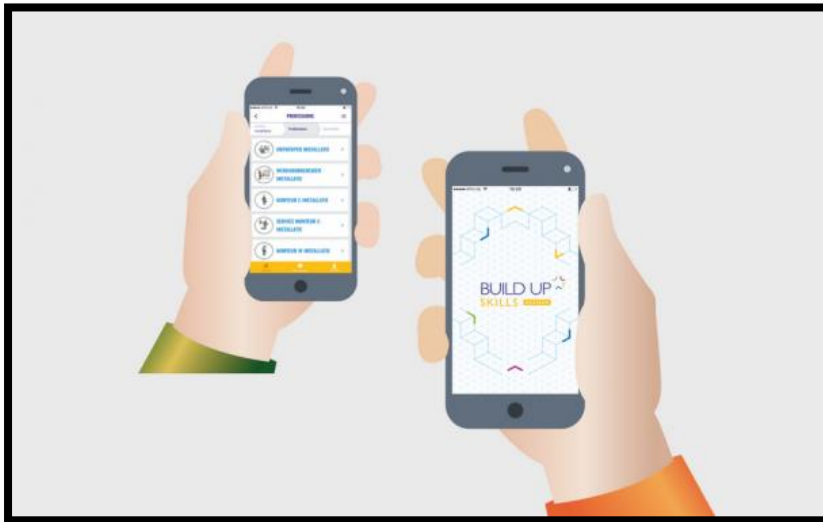
The PROF/TRAC website gathers an important library with material from previous projects (see annex 2). The PROF/TRAC repository classifies the material according to needed skills and qualifications. The categorization of the material according to the following building phases:

- Strategy development phase
- Pre-design phase
- IED phase
- Construction phase
- Use phase
- Maintenance and repair phase



Access the repository here <http://proftrac.eu/training-material/search-training-material.html>

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- ES for training courses available in Spanish



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