



# DESCRIPTION OF COMPETENCIES IN SELECTED HYDROGEN ECONOMY PROFESSIONS

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## Market and Hydrogen Regulation Analyst

### FRAMEWORK FOR MARKET AND REGULATORY ANALYSIS SPECIALISTS IN THE FIELD OF HYDROGEN

In the face of global challenges such as energy transition, regulatory changes and the need to implement sustainable solutions in the energy sector, the importance of specialised market and regulatory analysis in the field of hydrogen is growing. Hydrogen, as a key energy carrier of the future, is playing an increasingly important role in the transport, industry and energy sectors. To fully exploit its potential, thorough market analysis is required, as well as knowledge of the rapidly evolving regulations and standards related to its production, storage and use.

The aspects of market analysis and hydrogen regulations are a multidimensional challenge, requiring knowledge of global trends, international regulations, local energy policy strategies and emerging technologies. Specialists in this field will be key to the development of the hydrogen economy, enabling the effective and compliant implementation of hydrogen-based projects.

#### Demand for skills over the next 10 years

The demand for specialists in hydrogen market and regulatory analysis will increase significantly over the next 10 years, driven by the following trends:

1. Energy transition – hydrogen will be a key element of global decarbonisation, particularly in areas such as energy, industry and transport. Specialists will be needed to analyse market changes and support the development of the hydrogen sector.
2. Dynamic technological development – advances in hydrogen production and application technology require market analysis and regulatory adaptation to new innovations.
3. Development of legal regulations – the hydrogen market requires knowledge of emerging national and international regulations, which specialists will need to interpret and implement in practice.
4. Global infrastructure investment – the construction of hydrogen infrastructure, including pipelines, electrolyzers and refuelling stations, will increase the demand for experts to assess market investment opportunities and regulatory compliance.
5. Evolution of energy markets – as hydrogen applications develop, the demand for analyses of demand, supply and the economic efficiency of projects will continue to grow.
6. Sustainable development – specialists will be key in developing strategies that take into account environmental requirements, socially responsible investments and reducing the environmental impact of hydrogen.



7. Education and training – the increase in the number of specialists requires the intensification of educational programmes and the development of specialist courses related to market analysis and hydrogen regulations.

## Conclusions

In view of the above challenges and trends, the profession of hydrogen market and regulatory analysis specialist will become one of the key elements supporting the development of the hydrogen economy. Their work will enable a better understanding of market needs, the preparation of appropriate regulations and the design of strategies in line with the requirements of the energy transition. These specialists will play a fundamental role in the development of a sustainable, innovative and globally competitive hydrogen economy.

Hydrogen market and regulatory analysts Hydrogen market and regulatory analysis specialists will be among the most sought-after

experts in the coming decade. Their knowledge and skills will be crucial not only for achieving climate goals, but also for supporting the energy transition and building a competitive hydrogen economy. They will find employment in energy, consulting and research companies, as well as in public administration, international institutions and organisations involved in energy policy-making.

The job market for specialists in this field will grow dynamically, offering many opportunities, but also requiring high competence and flexibility in adapting to changing regulations and market needs. This qualification is an attractive choice for those who want to develop their career in the field of modern and sustainable energy technologies.

## Description of the qualification: Hydrogen Market and Regulatory Analysis Specialist

This specialisation covers competencies in market trend analysis, identification of investment opportunities, interpretation and implementation of national and international hydrogen regulations, and forecasting changes in the hydrogen sector. These specialists are prepared to:

- Hydrogen market analysis – assessing supply, demand and the economic viability of hydrogen projects.
- Managing regulatory compliance – monitoring regulations and standards relating to the production, storage, transport and use of hydrogen.
- Creating market strategies – supporting companies and institutions in designing hydrogen development strategies in line with rapidly changing regulations and technologies.
- Investment support – identifying and evaluating infrastructure projects in the hydrogen sector.



- Stakeholder cooperation – building relationships between the private sector, public administration and international organisations to promote effective legislative and market solutions.

Specialists in this field play a fundamental role in shaping the hydrogen market, enabling the implementation of sustainable and innovative solutions. Thanks to their work, the hydrogen economy can develop in line with market and regulatory needs, supporting the achievement of global climate goals and technological development.

Combining market analysis and hydrogen regulations:

- Market analysis: a key element is to study the supply and demand for hydrogen in the context of its growing role as an energy carrier. Specialists analyse market trends, identifying key sectors (e.g. transport, industry, energy) that can drive demand for hydrogen. Another important aspect is the assessment of the costs of hydrogen technologies, such as electrolyzers, energy storage and distribution infrastructure, in order to determine the profitability of investments.

- Regulations and standards: Regulations governing the production, storage, transport and use of hydrogen are a key area of work for specialists. This includes monitoring national and international standards, such as safety standards and green hydrogen certification.

Specialists also analyse the impact of regulations on market development and advise companies on compliance with applicable regulations.

- Energy policy and strategy: market and regulatory analysis specialists work with governments, international organisations and the private sector to develop policies that promote the development of the hydrogen economy. Key activities include identifying regulatory barriers, developing legislative proposals and supporting hydrogen-based decarbonisation strategies.

- Hydrogen technology development: specialists analyse the potential of new technologies, such as hydrogen storage in chemical compounds (e.g. ammonia) or low-carbon hydrogen production (green hydrogen from RES, blue hydrogen from CCS). Technology assessment is key to supporting investment and determining the potential for large-scale implementation.

- Market infrastructure: market analysis also includes assessing existing infrastructure (e.g. pipelines, terminals, refuelling stations) and planning its development. Specialists identify gaps in infrastructure and suggest the best logistics and investment solutions.

- Safety and risk: hydrogen is a flammable material and requires special care in storage and transport. Regulatory specialists develop safety recommendations and procedures, taking into account both technical and regulatory aspects to minimise the risks associated with its use.

Combining market analysis with regulations and policy allows for a comprehensive approach to the development of the hydrogen economy. Specialists in this field play a key role in the energy transition process, supporting the development of modern, sustainable hydrogen solutions.



Learning outcomes and assessment criteria for the profession of hydrogen market and regulatory analysis specialist

Competence 1: Hydrogen market analysis

Assesses market trends and identifies key sectors using hydrogen.

Learning outcomes	Verification criteria
Analyses market and statistical data on <del>by hydrogen available</del> data, taking into account various sectors of the economy.	Presents an analysis of market trends
<del>Identifies key sectors with high potential for growth in hydrogen demand (e.g. transport, industry, energy).</del>	
Assesses the profitability of investments in hydrogen technologies.	Prepares an economic assessment report on the implementation of hydrogen in a selected sector.
Analyses the competitive potential of the hydrogen market.	Identifies market players and assesses their impact on the development of the hydrogen economy.

Competence 2: Interpretation of hydrogen regulations and standards

Analyses legal regulations and standards concerning the production, storage, transport and use of hydrogen.

Learning outcomes	Verification criteria
Identifies key national and international regulations concerning hydrogen.	Prepares a summary of applicable regulations and standards concerning hydrogen.
Analyses the impact of regulations on the development of the hydrogen market, taking into account environmental and technological requirements.	Develops an analysis of the impact of regulations on the development of the hydrogen market.
Explains the principles of hydrogen certification (e.g. green hydrogen).	Prepares the documentation required for the hydrogen certification process.
Interprets safety standards for hydrogen.	Prepares instructions in accordance with legal requirements for the storage and transport of hydrogen ( ).

Competence 3: Planning market strategies for hydrogen

Develops strategies to support the development of the hydrogen market and cross-sector cooperation.

Learning outcomes	Verification criteria
Develops strategies for the development of the hydrogen market.	Prepares a strategic report taking into account short-term and long-term hydrogen market development scenarios.
Supports cooperation between the public	Presents proposals for joint actions to



and private sectors.	develop hydrogen infrastructure.
Analyses the impact of decarbonisation policies on the hydrogen market.	Prepares an analysis that takes into account climate targets and their implementation in hydrogen-related sectors of the economy.

#### Competence 4: Risk and safety assessment in the hydrogen economy

Analyses and minimises the risks associated with the use of hydrogen in various sectors.

Learning outcomes	Verification criteria
Identifies potential risks associated with hydrogen.	Identifies hazards in hydrogen production, storage and transport processes and proposes preventive measures.
Applies safety rules in hydrogen utilisation processes.	Prepares safety instructions accordance with international standards and emergency procedures.
Assesses the operational risks associated with hydrogen management.	Prepares a risk assessment report for a selected hydrogen-related investment.

#### Competence 5: Communication and cooperation in the field of hydrogen economy

Ensures effective communication and cooperation between various stakeholders in the hydrogen market.

Learning outcomes	Verification criteria
Communicates effectively with hydrogen market stakeholders.	Prepares presentations and reports tailored to the needs of different audiences (e.g. decision-makers, investors, engineers).
Supports cross-sector dialogue on hydrogen.	Organises workshops or consultation meetings with the participation of the public, private and scientific sectors.
Presents analysis results in a clear and professional manner.	Develops clear reports and visualisations of data on the hydrogen market.

Learning outcomes and verification criteria for the profession: Hydrogen market and regulatory analysis specialist

#### Competence 1: Hydrogen market analysis

Description: The specialist conducts hydrogen market analysis, identifies key trends, market needs and potential development opportunities in the hydrogen sector.

Learning outcomes	Verification criteria
Identifies key trends in the hydrogen market.	Prepares a report on current global and local trends in hydrogen.
Analyses potential customers for hydrogen technologies in various sectors.	Compiles a list of key industry sectors and their hydrogen needs.



Conducts a SWOT analysis of the hydrogen market in a specific region or country.	Presents the results of the SWOT analysis for the hydrogen market in a specific region or country.
Assesses the market opportunities for hydrogen as an alternative energy source.	Identifies specific areas of application for hydrogen and their market potential.
Analyses competition in the hydrogen market.	Prepares a profile, a competition identifying key market players and their strategies.
It assesses the impact of regulations on the development of the hydrogen market.	Prepares a report on national and international regulations that affect the hydrogen market.
Monitors investments in the hydrogen sector.	Prepares a summary of current and planned investments in the hydrogen sector.
Draws conclusions from market research and provides recommendations for companies.	Presents strategic recommendations for the company's development in the hydrogen market based on data collected from market research.
Predicts long-term changes in the hydrogen market based on data analysis.	Develops forecasts for the future development of the hydrogen market, taking into account technological, economic and social factors.
Uses analytical tools and software to conduct market analysis.	Presents market analysis results using tools such as Excel, Tableau or Power BI.

## Competence 2: Understanding the regulations governing the hydrogen market

Description: The specialist analyses legal regulations, technical standards and regulatory requirements related to the hydrogen sector.

Learning outcomes	Verification criteria
Knows national and international regulations concerning the production, storage and transport of hydrogen.	Prepares a summary of key regulations governing the hydrogen market in a given region.
Analyses the impact of regulations on the development of the hydrogen market.	Prepares a report identifying barriers and opportunities resulting from legal regulations.
Applies regulations concerning safety when working with hydrogen.	Demonstrates knowledge of safety requirements when working with hydrogen by analysing practical examples.
Identifies differences in regulations between EU countries and other regions of the world.	Compares legal regulations concerning hydrogen in different jurisdictions, pointing out differences and similarities.
Monitors legislative changes concerning hydrogen to account new regulations and changes in standards.	Prepares updates to legislative reports, taking into account new regulations and changes in standards.



Explains the requirements for certification of hydrogen technologies.	Presents a list of certificates and standards required for hydrogen equipment and installations.
Analyses the impact of taxes and financial incentives on the development of the support hydrogen-hydrogen sector.	Presents a summary of tax reliefs and programmes for hydrogen-related projects.
Draws conclusions regarding the compliance of companies' activities with applicable regulations.	Prepares an analysis of the compliance of companies' activities with legal requirements for the hydrogen sector.
Understands technical standards related to hydrogen installations and equipment.	Describes the technical requirements for hydrogen installations, taking into account the relevant ISO and EN standards.
Applies regulations related to environmental protection when working with hydrogen.	Demonstrates knowledge of environmental protection principles in the context of hydrogen storage and use.

Personal competences in the profession: Specialist in market analysis and regulations in the field of hydrogen

Competence	Description	Verification criteria
Communicates clearly and precisely with other team members and customers	Maintains clear and effective communication in conversations with the context of market analysis and regulations.	<p>Conducts effective communication in conversations with the context of market customers and the team, hydrogen adapting the manner of communication to the audience.</p> <p>Creates understandable reports and presentations, both for experts and for people without specialist knowledge.</p> <ul style="list-style-type: none"> <li>- Uses communication tools, such as digital platforms, to collaborate and present analysis results.</li> </ul>
Prepares reports and documentation for hydrogen market analysis.	Prepares detailed studies on the market and legal regulations.	<ul style="list-style-type: none"> <li>- Creates reports containing key market data and analyses of legal regulations.</li> <li>- Prepares documentation in accordance with regulatory requirements in the hydrogen sector.</li> </ul> <p>Creates clear and precise recommendations based</p>





		with representatives of the and <del>scientific</del> sectors.
Adapts work to global market requirements and cultural differences	Takes into account the specific nature of international standards and cultures in their work.	<ul style="list-style-type: none"> <li>- Creates documentation and reports in English, in accordance with international standards.</li> <li>- Participates in international conferences and uses the experience gained in local projects.</li> <li>- Cooperates with foreign partners, taking into account cultural and legal differences.</li> </ul>

Selected social competences for the profession: Market and hydrogen regulation analysis specialist:

Effective interpersonal communication – the ability to communicate clearly and comprehensively with various stakeholders (customers, project teams, authorities, institutions).

Teamwork – ability to work in a team, share knowledge and solve problems together.

Empathy – the ability to understand and respond appropriately to the needs and emotions of others in the workplace.

Conflict resolution – the ability to mediate and resolve disputes, ensuring a constructive atmosphere and maintaining work efficiency.

Negotiation – the ability to conduct effective negotiations with various stakeholders, including international partners, in order to achieve favourable terms of cooperation.

Stakeholder relationship management – building and maintaining long-term, positive relationships with customers, suppliers, and representatives of government and scientific institutions.

Presenting information – the ability to present complex technical and market information in an accessible and understandable manner.

Adapting to a changing environment – flexibility in adapting to changing market conditions, legal regulations and technologies.

Maintaining international contacts – ability to build and develop relationships with international partners in the hydrogen industry.

Mentoring and coaching – supporting less experienced team members, providing them with guidance and assistance in their professional development.

Engagement in local communities – initiating and participating in activities for the development of local communities in the context of hydrogen technologies.

Initiating sustainable development activities – taking actions to support the implementation of practices related to the green hydrogen economy.

Leadership skills – ability to lead a project team and responsibility for the group's performance.



Time management skills – effective management of time and priorities to achieve professional goals within the set time frame. Building trust – creating an atmosphere of trust and transparency in relationships with customers and colleagues.

Innovation – a proactive approach to identifying new solutions and introducing innovations in the field of hydrogen technologies and the market.

Attention to detail – attentiveness to detail and accuracy in market analysis, report writing and compliance with legal regulations.

Analytical skills in customer interactions – the ability to draw accurate conclusions from conversations with customers and stakeholders in order to provide the most appropriate solutions.

Cultural diversity management – the ability to work effectively with people from different cultures and with different experiences, which is particularly important when working in an international market.

Promoting professional ethics – acting in accordance with professional ethics and industry standards, promoting transparency in reports and analyses.

These social competences are key in the profession of Hydrogen Market and Regulatory Analysis Specialist, as they help to establish and maintain effective relationships with various stakeholders, influence the effectiveness of teamwork and enable the effective introduction of new solutions in the field of hydrogen economy.

Social competences with verification criteria for the profession: Hydrogen Market and Regulatory Analysis Specialist:

## 1. Effective interpersonal communication

Verification criteria:

Conducts effective conversations with clients and the team in simulated scenarios, such as discussing project plans or analyses.

Adapts communication style to the audience, using appropriate technical language or simplified terms depending on the audience.  
Actively listens to interlocutors, asks questions to ensure that they fully understand the needs of the customer or team member.

## 2. Teamwork

Verification criteria:

Provides support to team members by helping to solve technical or organisational problems during project implementation.  
Collaborates within the group to solve complex problems related to the hydrogen market, sharing ideas and suggestions.  
Accepts constructive criticism and proposes improvements to joint activities in order to increase team effectiveness.



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### 3. Empathy

#### Verification criteria:

Understands and responds to the emotions and needs of other team members, offering

help or support in difficult professional situations.

Is able to understand the position of partners from different backgrounds (e.g. local government, industry) and adapt communication to their expectations.

Conducts conversations in a manner that ensures the comfort and sense of security of the interlocutor, e.g. in the case of concerns related to the introduction of new regulations.

### 4. Conflict resolution

#### Verification criteria:

Identifies the causes of conflict within the team or between stakeholders and presents solutions that satisfy the interests of all parties.

Conducts mediation discussions while remaining neutral in order to reach a constructive solution to the problem.

Uses negotiation techniques to find a compromise in conflict situations concerning decisions (e.g. regarding hydrogen transport strategy).

### 5. Negotiation

#### Verification criteria:

Is able to negotiate terms of cooperation with suppliers or customers, striving to obtain favourable contract terms (e.g. prices, delivery dates).

During negotiations, effectively presents arguments supporting the negotiation objective, including on the implementation of hydrogen technologies.

Uses negotiation strategies to maintain long-term and positive relationships with business partners, even after the contract has been concluded.

### 6. Stakeholder relationship management

#### Verification criteria:

Regularly organises meetings and workshops with various stakeholders to exchange knowledge about the hydrogen market.

Creates and updates reports summarising the needs, expectations and requirements of stakeholders regarding the implementation of hydrogen technologies.

Implements cross-sector initiatives and collaborations to promote and develop the hydrogen market, including research and development projects.

### 7. Presentation of information



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#### Verification criteria:

- Prepares and presents reports and analyses in a clear, understandable and visually appealing manner, adapting the format to the audience.
- Uses appropriate tools to create presentations (e.g. PowerPoint, visual reports) to facilitate understanding of technical details.
- Skillfully communicates complex data on the hydrogen market or regulations in a way that is understandable to people without specialist knowledge.

### 8. Adaptation to a changing environment

#### Verification criteria:

- Effectively adapts project plans, taking into account regulatory or technological changes in the field of hydrogen.
- Participates in training and industry events to stay up to date with new trends, regulations and market requirements.
- Responds flexibly to changing customer needs and makes adjustments to project implementation strategies.

### 9. Maintaining international contacts

#### Verification criteria:

- Builds and maintains long-term relationships with international partners and organisations involved in the hydrogen market.
- Organises meetings and cooperates with foreign industry representatives to exchange knowledge on hydrogen technologies and regulations.
- Effectively negotiates and cooperates with international partners, taking into account cultural and market differences.

### 10. Mentoring and coaching

#### Verification criteria:

- Offers support to less experienced employees, helping them to understand complex issues related to the hydrogen market.
- Conducts coaching sessions to help others develop professional skills such as market analysis and regulation development.
- Shows initiative in organising training courses or workshops that increase the competence of team members.

### 11. Involvement in local communities

#### Verification criteria:



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Supports initiatives by local organisations that promote the development of the hydrogen economy in the community.

Participates in educational projects by organising workshops on hydrogen technologies in schools and educational institutions.

Promotes hydrogen energy ideas by developing informational materials for local communities.

## 12. Initiating actions for sustainable development

Verification criteria:

Implements measures to reduce the carbon footprint of hydrogen-related projects.

Prepares reports on the environmental impact of the company's activities, particularly in the area of hydrogen technology implementation.

Actively seeks innovative, environmentally friendly technological solutions as part of their professional work.

## 13. Leadership skills

Verification criteria:

Effectively manages the project team, ensuring clarity of objectives and efficiency in task implementation.

Skillfully motivates the team to achieve set goals, creating a friendly and supportive working atmosphere.

Able to make decisions in difficult situations, taking into account the needs of the organisation, stakeholders and the team.

## 14. Time management skills

Verification criteria:

Analyses tasks and sets priorities to ensure that objectives are achieved within the set deadlines.

Effectively plans their own and the team's work, eliminating delays in project implementation.

Maintains efficiency despite working under time pressure, while managing multiple tasks.

## 15. Building trust

Verification criteria:

Builds trust in relationships with customers and partners through transparency of actions and communication.

Maintains open and honest communication with the team, informing them about current challenges and progress in projects.



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Delivers on promises and commitments, as confirmed by both team members and customers.

## 16. Innovation

Verification criteria:

Proactively proposes innovative technological solutions in the field of hydrogen transport, storage and distribution.  
Engages in research and development projects to introduce new methods and technologies.  
He seeks new business models and ways of organising processes in the hydrogen industry.

## 17. Attention to detail

Verification criteria:

Carefully analyses documentation and reports, identifying errors and inaccuracies before final approval.  
Ensures compliance with standards and regulations by checking that all elements of the documents are correct and meet the requirements.  
Pays attention to details in the market analysis process, which allows for accurate conclusions to be drawn.

## 18. Analytical skills in customer interactions

Verification criteria:

Asks questions that help understand customer needs and provides them with analyses and recommendations based on those needs.  
Conducts market analysis at the request of customers, tailoring recommendations to their strategies.  
Presents complex market data in a way that customers can understand and apply.

## 19. Managing cultural diversity

Verification criteria:

Is able to establish effective cooperation with people from different cultural backgrounds, showing respect for differences.  
Takes cultural differences into account in negotiations with foreign partners, adapting their approach to the situation.  
Promotes cultural integration in the workplace by organising integration events.

## 20. Promoting professional ethics



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#### Verification criteria:

Regularly adheres to ethical principles, ensuring a fair and honest approach to market analysis and regulations.

Supports the creation and implementation of policies within the company that comply with regulations and industry standards.

Responds to unethical practices in a constructive manner and in accordance with the organisation's regulations.

Each competency has been enriched with specific criteria that allow for the assessment of the effectiveness of a hydrogen market and regulatory analysis specialist in the context of social competencies.

Key competencies in the development of hydrogen regulations in the workplace, with relevant verification criteria:

#### 1. Knowledge of legal regulations related to the hydrogen market

##### Verification criteria:

Identifies and interprets applicable national and international regulations related to the hydrogen market.

Develop recommendations for the compliance of projects with applicable legal regulations.

Will be able to identify gaps or ambiguities in regulations and propose appropriate changes or updates.

#### 2. Ability to develop technical norms and standards

##### Verification criteria:

Prepare detailed norms and standards for the safe transport, storage and distribution of hydrogen.

Develop guidelines for the implementation of hydrogen technologies in accordance with current industry standards.

Ensure that the regulations prepared are in line with international standards, e.g. ISO, IEC.

#### 3. Ability to develop hydrogen safety policies

##### Verification criteria:

Prepare regulations and procedures to ensure the safety of workers and the environment in hydrogen-related workplaces.

Develop regulations for protection against explosions, fires and other hazards associated with hydrogen.



Will introduce mechanisms for monitoring compliance with safety regulations and risk assessment.

#### 4. Ability to analyse risks associated with hydrogen systems

Verification criteria:

Conduct detailed risk analyses of hydrogen systems, such as hydrogen storage facilities and hydrogen transport.

Develop regulations on risk assessment and ensure appropriate countermeasures are in place to minimise risks.

Ensure that risk management systems comply with industry best practices.

#### 5. Development of regulatory compliance audit procedures

Verification criteria:

Develop audit procedures for legal, technical and environmental regulations relating to hydrogen.

Ensure a system for monitoring compliance within the organisation, including conducting regular audits.

Will be responsible for adapting audit procedures to changing regulations.

#### 6. Developing environmental regulations for hydrogen

Verification criteria:

Develop regulations to minimise the negative impact of hydrogen-related activities on the environment.

Define appropriate rules and procedures to control gas emissions and prevent pollution.

Develop regulations on waste management in the hydrogen sector, including recycling and disposal of materials.

#### 7. Ability to analyse the compliance of regulations with market requirements

Verification criteria:

It will be able to assess whether regulations are in line with market requirements, including in the field of hydrogen technology development.

It will develop regulations that take into account the specific nature of the hydrogen market, such as innovative technologies and new methods of hydrogen storage and transport.

Conduct comparative analyses of regulations from other countries or regions to ensure that they are competitive and modern.

#### 8. Cooperation with regulators and stakeholders in the development of regulations



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Verification criteria:

- It will cooperate with government representatives, regulatory agencies and industry organisations to develop new regulations.
- It will develop documentation on the need to introduce new regulations or update existing ones.
- Participate in meetings with stakeholders and gather feedback and data to improve regulations.

#### 9. Developing regulations for hydrogen transport

Verification criteria:

- Develop regulations concerning the safety and efficiency of hydrogen transport, both nationally and internationally.
- Will develop guidelines for transport infrastructure (e.g. gas pipeline networks, road and rail transport).
- Ensure that transport regulations comply with international standards (e.g. International Maritime Organisation, ADR).

#### 10. Developing regulations for education and training for hydrogen sector employees

Verification criteria:

- It will develop regulations on educational and qualification requirements for employees working in the hydrogen industry.
- Ensure the preparation and implementation of vocational training and certification programmes for industry employees.
- Monitor the effectiveness of training and adapt programmes to changing regulations and hydrogen technologies.

These competencies are key to the development of hydrogen regulations, enabling specialists to design and implement appropriate legal, technical and environmental regulations in this rapidly growing sector.

Below is a proposal for 8 training modules for the profession of Hydrogen Market and Regulatory Analysis Specialist. Each module has a specific duration, in accordance with the requirements, and consists of theoretical materials and practical exercises.

Module 1: Introduction to the hydrogen market and legal regulations

Module 2: Legal regulations and standards related to hydrogen safety      Module 3: Developing regulations for hydrogen infrastructure      Module 4: Hydrogen technologies and their impact on regulations      Module 5: Hydrogen market analysis



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Module 6: Project management skills in the hydrogen sector

Module 7: Monitoring and auditing compliance with hydrogen regulations

Module 8: International cooperation on hydrogen regulations

General description of training modules The training modules for the profession of Hydrogen

#### Market and Regulatory Analysis

Specialist form the basis for the development of a comprehensive educational programme that adapts to dynamic market and technological needs. Each module covers key aspects of theoretical and practical knowledge, enabling students to acquire the specialist skills necessary in the growing hydrogen economy.

These modules: Serve as the foundation for professional qualifications, supporting the development of

individual competences.

Prepare for effective action in the areas of market analysis, regulation and technological solutions for hydrogen.

Can be updated and developed as regulations and technologies change, ensuring that they remain relevant and respond to market needs.

They are a tool for obtaining micro-credentials that can be used in related professional qualifications.

The proposed modules are aimed at a wide audience, in particular those working in the renewable energy, logistics, transport, chemical, automotive and related sectors. Thanks to the modular structure, participants can acquire skills in selected areas, adapting the learning process to their professional needs.

#### Related professions for Market and Hydrogen Regulation Analysis Specialist

The training modules are particularly useful for people working in professions that require knowledge of hydrogen technologies, legal regulations and market analysis.

Logistics and Transport Specialist – responsible for the organisation of hydrogen transport and storage.

Renewable energy engineer – designs hydrogen solutions and integrates them with other energy sources.

Hydrogen technology technician – responsible for the operation and maintenance of hydrogen-related equipment.

Energy safety specialist – monitoring compliance with hydrogen safety standards.

Energy market analyst – analysing trends in the field of hydrogen and their impact on the energy sector.

Sustainable development advisor – supporting companies in the implementation of hydrogen economy-based solutions.



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Energy regulations specialist – creates legal regulations related to the hydrogen economy.

Technological innovation consultant – implementing new hydrogen technologies in various industrial sectors.

Automotive engineer for hydrogen technologies – developing hydrogen-based vehicles and propulsion systems.

Energy infrastructure designer – designing hydrogen storage and transport installations and systems.

Who are the training modules intended for?

Logistics and transport specialists – they can acquire skills in the safe transport and storage of hydrogen.

Energy engineers and technicians – they will expand their competences in hydrogen technologies, which will allow them to implement innovative solutions in the energy sector.

Employees of transport and logistics companies – they will prepare for new challenges related to the hydrogen economy.

Graduates of technical and natural science universities – they will gain an advantage in the labour market thanks to their specialist knowledge of hydrogen technologies.

Employees in the automotive sector – will acquire the knowledge needed to develop hydrogen technologies for vehicles and infrastructure.

Market analysts – will learn to assess the potential of the hydrogen economy and predict market trends.

Public and local government employees – responsible for implementing regulations related to the hydrogen economy.

Safety consultants in the energy industry – by acquiring knowledge of standards and legal regulations, they will be able to effectively supervise hydrogen projects.

Entrepreneurs in the technology industry – who want to implement innovations in the field of hydrogen.

People interested in sustainable development – who want to gain specialist qualifications in a sector that is key to the climate.

Summary The proposed modules are a flexible educational tool for a wide range of professionals.

Their modular structure allows them to be easily adapted to the needs of specific audiences, enabling them to acquire competences in both market analysis and the creation and implementation of regulations governing the hydrogen economy. Thanks to these training courses, participants can make a significant contribution to the development of new technologies and regulations in the hydrogen sector.

After completing the modules, participants will:

- Have extensive knowledge of market analysis, trends and technologies related to the hydrogen economy.



- Be familiar with legal regulations and standards concerning the use, transport, storage and distribution of hydrogen in various industrial sectors.
- Be able to develop rules and regulations in line with current national and international guidelines, supporting the development of the hydrogen economy.
- Conduct comprehensive market analyses, identifying potential areas for the implementation of hydrogen technologies and assessing their cost-effectiveness and environmental impact.
- Plan strategies for the implementation of hydrogen technologies, taking into account the needs of the public sector, industry and local communities.
- Identify risks and develop countermeasures to ensure safety in hydrogen-related logistics and operational processes.
- Communicate and cooperate effectively with representatives of industry, public administration and science in the implementation of the hydrogen economy.
- Be aware of the role of hydrogen in the energy transition and its importance for sustainable development and combating climate change.
- Create educational materials and reports to promote knowledge about hydrogen technologies among stakeholders and local communities.
- Develop your professional skills in the rapidly growing hydrogen technology sector, gaining a competitive advantage in the labour market.

Module 1: Introduction to the hydrogen market and legal regulations 24 hours

Duration: 24 hours (10 hours of lectures, 8 hours of practical exercises, 6 hours of workshops).

ERK level: 5-6

Objective: to familiarise participants with the basics of the hydrogen market, including technologies, methods of hydrogen storage and transport, and legal and regulatory provisions.

Topics: 1. Introduction to the hydrogen market – global and national conditions (4 hours)

History and development of the hydrogen economy worldwide and in Poland.

Factors driving the development of the hydrogen market, including technological and environmental aspects.

Key players in the hydrogen market – public sector, private sector and international initiatives.



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## 2. Hydrogen technologies – production, storage, transport (4 hours)

Hydrogen production methods (e.g. electrolysis, steam reforming, thermochemical methods) and their impact on the environment.

Modern solutions for hydrogen storage (high-pressure tanks, cryogenic storage).

Means of hydrogen transport – pipeline infrastructure, maritime and road transport.

## 3. Overview of hydrogen legislation: national and international regulations (4 hours)

Key legal documents concerning hydrogen in Poland (e.g. acts, regulations).

International norms and standards regulating the hydrogen economy (e.g. EU regulations, ISO standards).

Legal issues related to hydrogen safety in transport and storage.

## 4. The role of regulation in the development of the hydrogen economy (4 hours)

The impact of regulations on accelerating the implementation of technological innovations.

The role of climate policy in shaping hydrogen regulations.

Support mechanisms for the development of the hydrogen sector (e.g. subsidies, tax breaks, EU funds).

## 5. Analysis of hydrogen market needs (4 hours)

Methods for identifying potential hydrogen consumers in various sectors of the economy.

Factors influencing market demand for hydrogen (costs, efficiency, sustainable development).

Use of SWOT analysis to assess the potential for implementing hydrogen technologies.

## 6. Introduction to the analysis of regulations and their impact on economic activity (4 hours)

Methods of analysing legal regulations and their interpretation in the context of economic activity.

Examples of regulations affecting decision-making processes in hydrogen companies.

Assessment of the risks and benefits of regulations for entrepreneurs implementing hydrogen technologies.

## Module 2: Legal regulations and standards related to hydrogen safety (6 hours)

Objective: To understand safety regulations for the storage, transport and use of hydrogen.

Topics covered:

### 1. Regulations concerning the transport and storage of hydrogen:

Analysis of national regulations on hydrogen transport (e.g. ADR, local laws).



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Obligations and requirements for hydrogen transport operators.

Regulations concerning the location and construction of hydrogen storage facilities.

## 2. Safety standards for hydrogen storage and transport systems:

Design standards for hydrogen tanks and storage systems (e.g. high-pressure and cryogenic tanks).

Requirements for the installation of safety devices in hydrogen storage facilities.

Rules for the control and inspection of storage and transport systems.

## 3. International standards for hydrogen transport (e.g. ADR):

Classification of hydrogen as a hazardous substance in international regulations.

Transport procedures for hydrogen in various states of aggregation (gas, liquid).

Requirements for the labelling and documentation of hydrogen transport.

## 4. Basic safety rules related to hydrogen: explosiveness, flammability, hydrogen embrittlement:

Properties of hydrogen and their impact on fire and explosion risk.

Explosion protection principles in hydrogen systems.

Hydrogen embrittlement – impact on construction materials and countermeasures.

## 5. Risks in hydrogen management – hazard analysis:

Identification of potential hazards associated with hydrogen storage and transport.

Risk assessment methods for hydrogen systems.

Creating plans to minimise hydrogen-related hazards.

## 6. Emergency response procedures for hydrogen-related incidents (e.g. leaks, explosions, system failures):

Development of emergency response scenarios.

Individual and group protective measures in the event of hydrogen-related failures.

Training in crisis management and coordination of rescue operations.

Exercises:

Development of documentation containing safety procedures for the storage and transport of hydrogen.

Risk analysis based on a hydrogen leak scenario.

Discussion on the application of various safety technologies in the hydrogen industry.

**Module 3: Creating regulations for hydrogen infrastructure (6**

Module objective: To provide knowledge on regulations and standards related to the development of hydrogen infrastructure (production, storage, transport).



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## 1. Basics of creating legal and technical regulations for hydrogen infrastructure

Discussion of the basic principles and legislative processes related to the creation of regulations for hydrogen infrastructure.

Analysis of the differences between national and international regulations.

Discussion on key stakeholders in the regulatory process (industry, government, local communities).

## 2. Regulations concerning the construction and operation of hydrogen installations (gas pipelines, filling stations, storage facilities)

Overview of technical and legal requirements for the design and construction of hydrogen installations.

Analysis of examples of good practices in the operation of hydrogen infrastructure.

Identification of key risks and ways to minimise them in the operation of installations.

## 3. Analysis of challenges related to hydrogen infrastructure

Identification of technical and environmental challenges related to the construction of hydrogen infrastructure.

Discussion of legal and economic barriers to the development of hydrogen infrastructure.

Workshop: proposals for solutions to key problems in hydrogen infrastructure based on case studies.

## 4. Examples of regulations in the field of technical standards (e.g. material quality, installation design)

Analysis of applicable technical standards for hydrogen installation materials and structures.

Comparison of national regulations with international requirements (e.g. ISO, EU).

Practical exercise: analysis and evaluation of technical documentation for a hypothetical hydrogen installation.

## 5. Environmental requirements for hydrogen infrastructure

Discussion of the impact of hydrogen infrastructure on the natural environment.

Overview of legal requirements for environmental protection (environmental impact assessment, emission standards).

Exercise: analysis of a case study including an environmental assessment for a hydrogen infrastructure project.

## 6. Principles of cross-sectoral cooperation in the development of hydrogen regulations

Discussion of methods of cooperation between the government, industry and the scientific community in the legislative process.

Examples of public dialogue and consultation in the regulatory development process.



Discussion: how to effectively adapt national regulations to international standards and EU requirements.

Exercises:

Developing draft regulations on the construction of hydrogen infrastructure.

Analysis of cases of investment in hydrogen infrastructure in different countries.

Group discussion on the impact of regulations on infrastructure development.

Module 4: Hydrogen technologies and their impact on regulations 6h

Objective: to understand hydrogen technologies and their impact on the creation of regulations and legal standards.

Topics:

1. Hydrogen production technologies: electrolysis, methane reforming, biological processes

Overview of hydrogen production methods – comparison of technology efficiency and costs.

Impact of hydrogen production technologies on the environment (emissions, energy consumption, waste).

Analysis of potential limitations and future development opportunities for hydrogen production technologies.

2. Hydrogen storage technologies: liquefaction, pressure, chemical materials

Advantages and disadvantages of different hydrogen storage technologies depending on industrial applications.

Technical and safety requirements for hydrogen storage systems.

Discussion of innovations in hydrogen storage materials (e.g. metal hydrides).

3. Hydrogen transport technologies: pipelines, road, sea and rail transport

Challenges associated with transporting hydrogen in different states of aggregation (gas, liquid).

Regulations and technical standards for hydrogen transport in different countries.

Analysis of costs and risks associated with transporting hydrogen using different methods.

4. How technologies influence the creation of regulations in the hydrogen sector

The process of integrating hydrogen technologies into the existing legal framework.

Examples of regulatory changes influenced by the development of new technologies (e.g. safety, quality standards).

Analysis of legislative needs related to the development of innovative hydrogen technologies.



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## 5. Maintaining and developing new technologies in compliance with regulations

Certification and approval procedures for hydrogen technologies.

The role of audits and monitoring in maintaining technology compliance with regulations.

Impact of regulatory changes on the modification and development of hydrogen technologies.

## 6. Sustainable development and technological innovation in the hydrogen sector

Assessment of hydrogen technologies in terms of sustainable development goals (SDGs).

The impact of green hydrogen on energy transition and climate protection.

Prospects for technological innovation in the context of global environmental and regulatory requirements.

Exercises:

Developing a scenario for the implementation of new hydrogen technology in accordance with regulations.

Simulation of group work on the design of a new hydrogen transport system.

Analysis of the impact of technology on legal regulations in different countries.

### Module 5: Hydrogen market analysis

Objective: to provide skills in hydrogen market analysis, including supply and demand research, trend forecasting and competition analysis.

Topics:

#### 1. Introduction to hydrogen market analysis methods

Key market analysis indicators: demand, supply and price analysis.

Market monitoring tools: industry reports, statistical data, forecasts.

The process of data collection and verification for reliability.

#### 2. Hydrogen market development forecasts: factors influencing demand and supply

Economic factors influencing the development of the hydrogen market (e.g. production costs, profitability).

Environmental factors as a driver of hydrogen market growth.

The importance of technological innovation in shaping hydrogen supply and demand.

#### 3. Trends in the hydrogen market: regulations, innovations, technological changes

The role of environmental and climate regulations in shaping the market.

Overview of technological innovations affecting the efficiency of hydrogen production and transport.



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Examples of global market trends in hydrogen.

#### 4. Analysis of competition in the hydrogen market

Identification of key players in the hydrogen market and their strategies.

SWOT analysis for companies operating in the hydrogen sector.

Tools for assessing competition: benchmarks, market share analysis, competitive advantages.

#### 5. Forecasting market needs and regulatory requirements

Techniques for forecasting demand in the context of hydrogen (e.g. trend analysis, development scenarios).

Assessment of regulatory gaps and their impact on market development.

Formulating recommendations for governments and businesses based on market forecasts.

#### 6. Impact of global and local policies on the hydrogen market

Analysis of policies supporting the development of the hydrogen economy in different regions.

Assessment of the impact of EU regulations and strategies on the national hydrogen market.

Alignment of local actions with international agreements, such as the Paris Agreement.

Exercises:

Conducting a SWOT analysis of the hydrogen market in a selected region.

Prepare a report forecasting the development of the hydrogen market over a period of 5 years.

Case study on the development of the hydrogen market in different countries.

Module 6: Ability to manage projects in the hydrogen sector 6 hours

Objective: To develop skills related to the management of technological and regulatory projects in the field of hydrogen.

Topics:

#### 1. Introduction to project management in the hydrogen sector

Definition of project management: basic concepts and principles of project management.

Characteristics of hydrogen projects: specifics and challenges related to hydrogen projects in the energy sector.

Hydrogen project life cycle: stages from concept to implementation and operation of hydrogen projects.



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## 2. Planning projects in the field of hydrogen: objectives, resources, schedule

Setting project objectives: how to set SMART objectives and adapt them to the specific nature of hydrogen projects.

Resource allocation: how to effectively plan human, financial and technical resources in hydrogen projects.

Creating a schedule: time planning techniques (e.g. Gantt chart, critical path) in hydrogen projects.

## 3. Risk assessment and risk management strategy in projects

Risk identification: what are the typical risks associated with hydrogen projects (technological, regulatory, environmental).

Risk assessment: risk assessment methods (e.g. SWOT analysis, risk matrix).

Risk management strategies: ways to minimise, avoid and transfer risk in hydrogen projects.

## 4. Project management methodology in accordance with legal regulations

Basic legal regulations in the hydrogen sector: discussion of national and international regulations that affect project management.

Compliance management: which norms and standards are relevant to the implementation of hydrogen projects.

Project documentation management: what documents and processes are required for legal compliance.

## 5. Cooperation with stakeholders: governments, industry, international organisations

Identifying stakeholders: How to identify key stakeholders in hydrogen projects.

Building relationships with governments and international organisations: what actions should be taken to ensure support for a hydrogen project.

Cooperation with industry: How cooperation with technology, industrial and scientific companies supports project implementation.

## 6. Monitoring and evaluation of projects in the hydrogen sector

Project success indicators: how to define and monitor key performance indicators (KPIs) in hydrogen projects.

Tools for monitoring progress: What tools and technologies support the monitoring of project implementation.

Evaluation of results and final assessment of the project: how to conduct a final analysis of the project and draw conclusions for the future.

### Exercises:

Developing a schedule for a hydrogen technology implementation project.

Risk analysis in a hydrogen infrastructure construction project.



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Group work on planning and managing a hydrogen project.

## Module 7: Monitoring and auditing compliance with hydrogen regulations 6h

Objective: Preparation for monitoring and auditing the compliance of projects with hydrogen regulations.

Topics:

### 1. Audit of legal regulations and technical standards in the hydrogen sector

Overview of hydrogen regulations: analysis of applicable national and international regulations on hydrogen production, transport and storage.

Technical standards in the hydrogen sector: introduction to technical standards relating to hydrogen infrastructure, such as standards for materials and equipment for hydrogen transport and storage.

Changes in legal regulations: what changes may occur in regulations and standards relating to hydrogen, and how they should be taken into account in the audit process.

### 2. Procedures for monitoring compliance in hydrogen organisations

Compliance monitoring process: discussion of the steps to be taken to monitor compliance with regulations and standards in hydrogen organisations.

Reporting non-compliance: what procedures to follow when non-compliance is detected and how to respond to detected irregularities.

Monitoring compliance with internal organisational policies: what internal procedures to implement to ensure compliance with regulations and standards and avoid legal risk.

### 3. Roles and responsibilities of the auditor in the hydrogen sector

Scope of the auditor's responsibilities: what duties and responsibilities does the auditor have when conducting audits in hydrogen projects?

Cooperation with project teams and managers: what are the expectations regarding the auditor's cooperation with other departments of the organisation, especially with technical teams, in order to achieve full compliance with regulations.

Auditor training: what competencies should auditors have in order to effectively assess hydrogen-related projects, including knowledge of standards, regulations and hydrogen technologies.

### 4. Audit tools and methods in the field of hydrogen

Technological tools: the use of IT tools to conduct audits (e.g. compliance monitoring and documentation management software).

Audit methodology: introduction to audit methods such as internal audits, external audits, documentation audits and field audits.



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Conducting audits at hydrogen facilities: how to conduct audits at physical hydrogen-related facilities, such as hydrogen refuelling stations, storage facilities and hydrogen production plants.

## 5. Reporting audit results and recommendations for improvement

Audit report structure: what a compliance audit report should look like, how to effectively present audit results and recommendations for improvement.

Formulating recommendations: how to formulate recommendations in the context of regulatory compliance that are understandable and feasible for the organisation.

Monitoring the implementation of recommendations: how to track and verify whether the organisation is implementing the audit recommendations and whether compliance with regulations has improved.

## 6. Challenges and solutions in auditing hydrogen projects

Complexity of legal regulations: what challenges arise as a result of the diversity of regulations and standards relating to various aspects of the hydrogen sector, e.g. transport, production, hydrogen storage.

New technologies in the hydrogen sector: what difficulties do auditors encounter when auditing projects related to new, emerging technologies that may not yet have fully regulated legal standards?

Evolution of regulations and adaptation of audits: what changes in regulations may affect the auditing of hydrogen projects and how auditors should adapt their audit methods in response to changing regulations.

Exercises:

Conducting an audit of a hydrogen project's compliance with regulations.

Preparing an audit report on regulations and standards in the hydrogen sector.

Analysis of audit cases in various hydrogen projects.

## Module 8: International cooperation on hydrogen regulations 6h

Objective: To provide skills in cooperation with international organisations and regulations concerning hydrogen.

Topics:

### 1. International cooperation on hydrogen regulations

Exchange of best practices and experiences in hydrogen regulation.

Coordination of activities and harmonisation of regulations at international level.

Challenges associated with a global approach to hydrogen regulation and the need for consistency.



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## 2. Introduction to international organisations and institutions involved in hydrogen (e.g. International Energy Agency, ISO)

Key international organisations that shape hydrogen policy and regulation. The role of the International Energy Agency (IEA) in promoting hydrogen policies around the world.

ISO and other organisations' initiatives on technology standards and hydrogen norms.

## 3. Adaptation of national regulations to international standards

The process of adapting national regulations to global standards, e.g. in the areas of safety, transport and hydrogen production.

Challenges related to differences in national and international regulations. What legal and regulatory mechanisms support the adaptation of national regulations to international standards.

## 4. Information flow and cooperation between the public and private sectors on a global scale

Mechanisms for cooperation between governments, regulatory institutions and the private sector on hydrogen.

Creation of international partnerships and agreements for the development of the hydrogen market.

Joint research projects, innovation and development of hydrogen technologies through public-private cooperation.

## 5. Sustainable development of the hydrogen market at international level

International challenges related to the introduction of sustainable technological solutions in the hydrogen sector.

The role of international regulations and policies in promoting the sustainable development of the hydrogen market.

Examples of international agreements on environmental protection and support for a hydrogen-based economy.

## 6. Risk management and compliance with international regulations How international rules and regulations affect risk management in hydrogen projects.

Mechanisms for monitoring and auditing regulatory compliance in an international context.

Challenges related to the integration of safety, environmental and technological regulations in global hydrogen projects.

Exercises:



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Preparation of a report on international hydrogen regulations and their impact on national regulations.

Group work on a scenario for cooperation with foreign organisations.

Simulation of negotiations between international organisations and national governments.

These eight modules constitute a comprehensive training programme that prepares specialists to work effectively in the hydrogen industry, both in terms of market analysis and the creation and monitoring of legal regulations.



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