WP6: D6.3

Regulatory requirements for hydrogen demonstration projects

Report Status: **Final**

Report Date: **31.12.2010**

Author(s): Bas van Bree, Ingo Bunzeck (ECN)

Acknowledgement

This project is co-financed by funds from the
European Commission under
FCH-JU-2008-1 Grant Agreement Number 245133.

The project partners would like to thank the EC for establishing the New Energy World JTI framework and for supporting this activity.

Disclaimer

This document is the result of a collaborative work between NextHyLights Industry and Institute partners. The results of the research were subsequently elaborated and presented in a coherent manner, which involved extensive stakeholder consultation in locations around the world as well as feedback from the NextHyLights Industry Partners.

The ideas presented in this document were reviewed by certain NextHyLights project partners to ensure broad general agreement with its principal findings and perspectives. However, while a commendable level of consensus has been achieved, this does not mean that every consulted stakeholder or NextHyLights Industry Partner necessarily endorses or agrees with every finding in the document. The producer of this document is the sole responsible for its content and recommendations.

Table of Contents

1 Introduction

This report is part of the NextHyLights project, that aims to support the next phase of large-scale demonstration projects in hydrogen transport. The project has 12 partners from industry and academia and is financed by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), with equal contributions from the European Commission and industry partners from Europe.

Hydrogen demonstration projects serve to produce real-life experiences with hydrogen vehicles and infrastructure. In Europe, several demonstration projects have taken place, several are ongoing, and more will take place in the near future. The FCH JU coordinates and funds these demonstration projects at a European level.

The aim of this report is to inform the FCH JU on the regulatory requirements for hydrogen vehicle demonstration projects in selected EU countries, with a focus on approval procedures for infrastructure (i.e. hydrogen refuelling stations). Approval procedures for hydrogen infrastructure play an important role in the start-up phase of a demonstration project. The information requested as input to the procedure can be extensive, requiring a relatively large dedication of resources. Moreover, the procedure may be lengthy, delaying the start of the operational phase of the project. These two aspects can be exacerbated by a lack of experience on the side of authorities and a lack of regulations specific for hydrogen infrastructure.

Chapter 2 is a comparison of the approval procedures in six countries (France, Norway, Germany, Italy, the Netherlands, and Austria). The FCH JU may use this information to determine the relative attractiveness of each of these countries for hydrogen demonstration projects from a regulatory point of view.

Chapter 3 provides more details on the approval procedures in each of the respective countries. This chapter is useful for readers that are interested in country-specific details.

Chapter 4 deals with the regulatory situation on hydrogen vehicles. Regulation on hydrogen vehicles is handled on a European level and is decidedly less complex since EU Regulation 79/2009 has entered into force.

The final chapter sums up the conclusions. After this chapter, an appendix provides information on the people that have been consulted for this study.

2 Comparison of approval procedures

Approval procedures and permitting requirements are key to ensuring acceptable safety levels for hydrogen refuelling stations. They also minimise the impact hydrogen refuelling stations have on the local environment, e.g. by defining acceptable risk levels and requirements for storage of potentially harmful substances. However, procedures and requirements also have an impact on the lead time and on the costs of hydrogen demonstration projects.

Approval procedures for hydrogen refuelling stations differ from country to country in terms of lead time, complexity and clarity (Air Liquide DTA (ed.), 2008). In part due to the unfamiliarity with hydrogen, lead times for hydrogen refuelling stations can be longer than lead times for conventional refuelling stations. The procedure quickly becomes quite complex due to the range of issues that needs to be considered and the number of actors that are potentially involved. Finally, the requirements for a hydrogen refuelling stations are often unclear, partly due to a lack of specific regulation on a local level.

HyApproval

The FP6-funded project HyApproval has demonstrated that approval procedures for hydrogen refuelling stations can easily become very complex. The project also notes that hydrogen-specific regulation is mostly lacking at a national scale.

The key recommendation of the project is therefore to develop an EC regulatory framework for hydrogen refuelling stations. The framework should be based on essential requirements, harmonized standards, and notified bodies. Preferably, the procedure should involve a single authority and a single notified body, to be defined at the most appropriate level.

A major deliverable of the project is a handbook for hydrogen station approval. The purpose of this handbook is to provide guidance and support to stakeholders regarding applicable standards and regulation.

Source: (Air Liquide DTA (ed.), 2008)

In the project HyApproval, a number of organizations have argued for European regulation for hydrogen refuelling stations, similar to the EU Regulation that enables European-wide type-approval of hydrogen vehicles (see also text box)[1]. However, for now such a regulation is not a reality yet. Partners in hydrogen demonstration projects therefore have an interest in selecting those sites (and hence, countries) to which procedures apply that have a relatively brief lead time, are simple and have

[1] This is not the common position of all of the partners of HyApproval.

clear requirements. This chapter provides a high-level comparison of approval procedures in six countries to assist organisations with an interest in setting up hydrogen refuelling stations in selecting a site with a relatively smooth procedure.

Table 2.1 provides an overview of the current lead time, potential lead time, complexity and clarity of the approval procedures for the six countries studied. These countries have been selected because hydrogen activities are currently deployed or may be deployed in the near future. Six countries represent the maximum that could be reviewed in the current task.

The current lead time has been estimated using the input of interviewees[2] that have been involved in permitting procedures. Note that this lead time only includes steps in the permitting procedure, not the commissioning of the station itself. The interviewees have also been asked to provide an estimate of the lead time that the procedure might take once more experience with hydrogen has been gained. This time has been labelled 'potential lead time'. The complexity of the procedure has been qualitatively assessed based on the number of authorities involved and the number of steps in the procedure. The clarity of the procedure has been qualitatively assessed based on to which extent the regulatory requirements for the station were clear from the start of the procedure. The latter aspect depends to a large extent on whether hydrogen-specific regulation is in place.

The results are based on careful analysis. However, the situation for new projects may be different from the results described here, because new projects may take place in a different region or because regulations have changed.

Table 2.1 *Comparison of approval procedures for hydrogen stations*

	Current lead time	**Potential lead time***	**Complexity**	**Clarity**
Germany	3-6 months	3-5 months	+	+
The Netherlands	6 months	~5 months	++	+
Norway	3-9 months	2-7 months	++	+/-
Austria	8-11 months	4-6 months	++	+/-
Italy	7-8 months**	4-5 months	+	+/-
France	10-12 months	?	+/-	+/-

* Potential lead time refers to the expected lead time when more experience has been gained with hydrogen.

** Lead times for Italy is based on the experience of the Zero Regio project. New regulation has since been established which may result in reduced lead times in the future.

Legend: ++ very good, + good, +/- needs improvement.

[2] Please refer to the appendix for a list of interviewees.

Germany has a relatively short lead time and relatively many experiences in setting up hydrogen refuelling stations. The approval procedure is straightforward and the number of authorities involved is relatively small. The fact that specific guidelines for hydrogen refuelling stations are available (VdTÜV Merkblatt 514) adds to the clarity of the procedure.

Lead time in **the Netherlands** is a bit longer, but comparable to that in Germany. The procedure is very transparent, as only one permit is required, which is handled by one single authority. There are dedicated national guidelines on hydrogen, but clarity could still be improved if (standardised) legal requirements for hydrogen refuelling stations would be established. This could lead to a slight reduction of the lead time.

The approval procedure in **Norway** can be relatively quick, but can – in certain cases – also take up to nine months. The lead time may be reduced slightly in the future. The procedure is very straightforward and involves only few authorities. National standards and regulations are not hydrogen-specific; clarity could be improved if hydrogen-specific standards and regulations would be developed.

In **Austria**, the approval procedure is currently still quite lengthy, but holds the promise to become much shorter once more experience with hydrogen has been gained. The procedure is very straightforward and does not involve many authorities. Regulation in Austria is not hydrogen-specific – requirements are based on regulation for CNG stations.

The lead time in **Italy** is comparable with the lead times in the previous four countries other countries and may be reduced due to increasing familiarity with hydrogen. Although the procedure has proven quite complex in prior projects, a single office handles the application (and consults the other authorities that need to be involved), which makes the procedure relatively simple. The Decree that Italy implemented in 2006[3] makes the requirements for hydrogen refuelling stations much clearer. On the other hand, there are some peculiarities in the Italian regulation that can complicate the procedure. There is therefore still room for improvement in the regulatory situation in Italy.

The regulation for hydrogen refuelling stations in **France** is based on regulation for industrial plants with hydrogen-related activities. The lead time quoted in Table 2.1 is based on the typical lead time for this type of installations. With 10-12 months, this lead time is the longest of all the countries surveyed.
The procedure in France is complex, consisting of many steps and the input from many authorities, as well as from the public. The lack of regulation specific for hydrogen refuelling stations makes the requirements relatively unclear.

[3] Decreto 31 agosto 2006: Approvazione della regole tecnica di prevenzione incendi per la progettazione, costruzione ed esercizio deglli impianti di distribuzione di idrogeno per autotrazione.

3 Approval procedures for hydrogen refuelling stations in selected EU countries

This chapter provides a description of the approval procedures in six different European countries. These descriptions are based on desk research and input from relevant actors in the various countries[4].
This report does not make any claim as to the accuracy of the descriptions. These descriptions only serve as input for the comparison of approval procedures across countries. The authors strongly advise anyone who is planning to engage in any of the procedures described to conduct a thorough investigation of their own, also because the procedures may be subject to change.

Additionally, the lead times of the permitting procedures are described. The lead times are based on the permitting procedures only and do not include the time required for the construction of the refuelling stations. The lead times for approval procedures are currently relatively long due to the unfamiliarity with the technology and may be reduced if more experience with the technology and procedures is acquired. If possible, an estimate of the scope for such lead time reduction is provided.

3.1 Germany

A building permit and a operating permit are required for a hydrogen refuelling station in Germany. In the framework of the Zero Regio project, which included the construction of a multi-fuel refuelling station including hydrogen, guidelines for hydrogen refuelling stations were developed in the form of TÜV Merkblatt 514 (Backhaus & Bunzeck, 2010).

Procedure

Figure 3.1 is a schematic representation of the approval procedure for a hydrogen refuelling station in Germany. To open and operate a hydrogen refuelling station in Germany two permits are required: an operating permit and a building permit.

The procedure for the **operating permit** starts with a ‘reconciliation talk’ between the applicant, the equipment manufacturer and the station operator[5] on the one side and the local planning office and the fire brigade on the other side. These organisations formulate an ‘expert statement’.

[4] Please refer to the appendix for a list of interviewees.

[5] Note that the applicant and the station operator may be the same organization.

The applicant then proceeds to notify the lower building inspection and the competent permitting authority[6] of the plans to build a hydrogen refuelling station. These two authorities have a maximum of three months to provide a reply to the notification.

Based on this reply, the applicant prepares the application for the operational permit. This application is submitted to the competent permitting authority. If all requirements are met, the competent permitting authority will issue the operating permit.

In parallel, the procedure for the **building permit** takes place. This procedure is only concerned with the buildings that will be erected on the site and is not complicated by the fact that hydrogen will be dispensed at the site. Since the buildings that are erected on the site of a refuelling station are typically not very complicated, the procedure is straightforward. The applicant submits the application for the permit to the local building authority, who grants the permit if all requirements are fulfilled.

After both permits have been obtained the construction of the refuelling station may start[7]. After construction has finished, the competent safety organisation carries out a start-up inspection. When the station is found to be safe, operation may commence.

Lead time

The total lead time for the permitting procedure is approximately 3-6 months and is determined by the lead time for the operating permit. For the hydrogen refuelling station in Cologne, this procedure took about 8 weeks, while it took about 5 months for the refuelling station in Hoechst[8]. Note that the lower building inspection and the competent permitting authority are allowed to take three months to provide a reply to the notification of the plans of the applicant (step 2). The total lead time of the procedure increases if they utilise their maximum time.

The approval procedure for the building permit took about 4 weeks in Cologne and about 10 weeks in Hoechst. It can be done in parallel to the operating permit procedure and does therefore in principle not influence the total lead time.

The start-up safety inspection is very short. In Cologne, this procedure only took about one hour.

In Cologne, it was not expected that the lead time of the procedure can be shortened due to increasing familiarity with the technology. In Hoechst, the lead time was longer than the project team expected, due to unfamiliarity with hydrogen as an automotive fuel (Sapio & Infraserv, 2006). We have not obtained an estimate for the extent by

[6] The competent permitting authority may differ from state to state. In the case of the refueling station established by HyCologne in Cologne, it is the ‘Bezirksregierung’.

[7] Technically, construction of the station may already start after the building permit has been granted.

[8] Main difference is that at the station in Cologne only hydrogen is offered, whereas the station in Hoechst offers multiple fuels.

which the lead time could be reduced in the future, so we assume a conservative 1 month here.

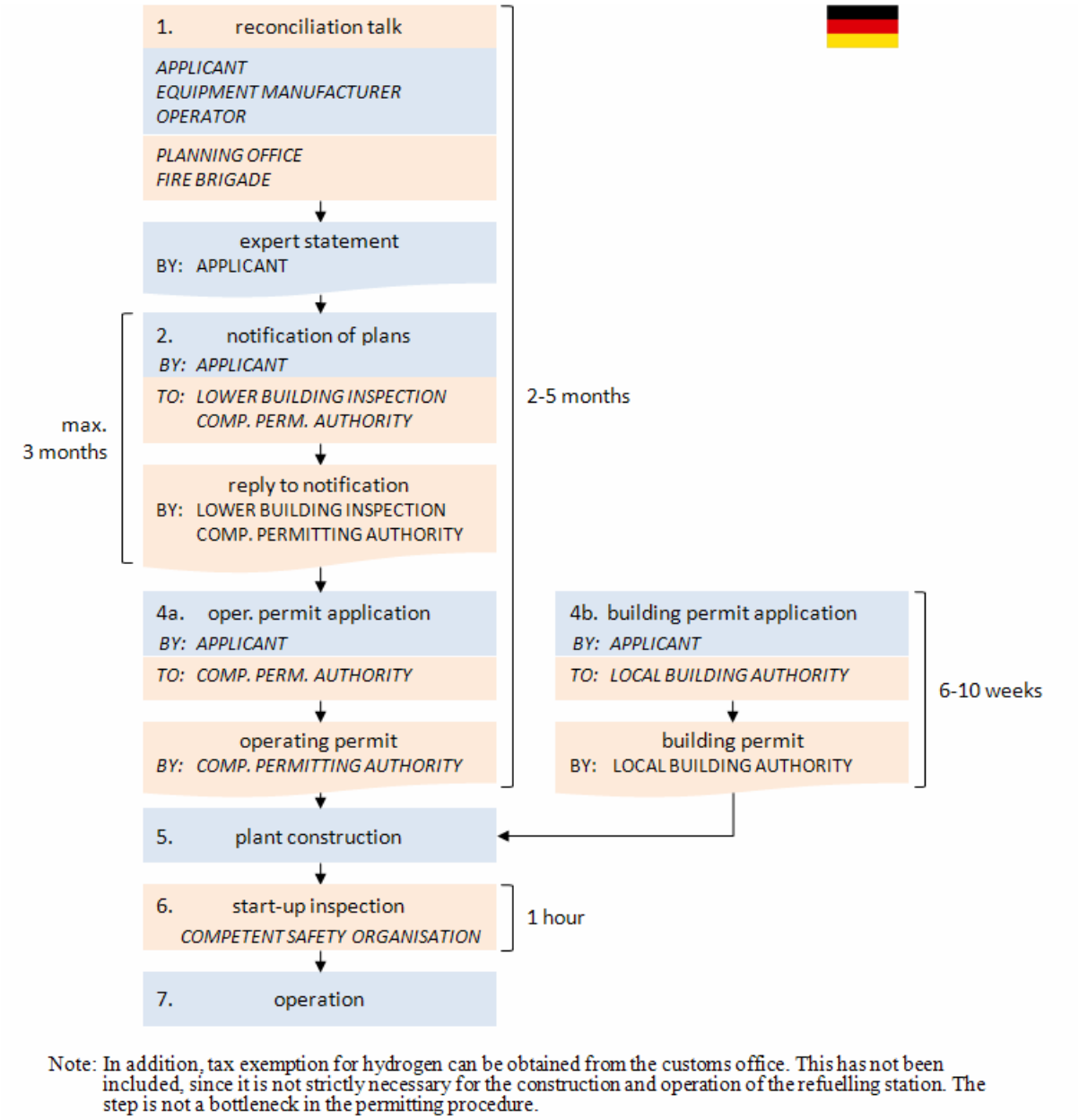

Figure 3.1 *Approval procedure in Germany. This figure is based on HyApproval (Air Liquide DTA (ed.), 2008) and refined with the outcome of interviews*

3.2 France

In France, a hydrogen refuelling station is regarded as a 'classified installation' (Installation Classée pour la Protection d'Environnement, ICPE). As a consequence, the permitting procedure is similar to the procedure for an industrial plant with hydrogen-related activities, and the SEVESO II Directive applies.

Procedure[9]

Figure 3.2 is a schematic representation of the approval procedure for a hydrogen refuelling station in France. To operate a hydrogen refuelling station, an operating permit and a building permit are required.

The procedure for the **operating permit** starts with the submission of the application by the applicant to the departmental prefect and to the communes that are affected by the station. The application includes a risk assessment which serves to inform the authorities that risks have been identified and that measures have been taken to reduce the risks to acceptable levels. The risk assessment also serves as input to the land planning process (PPRT) and identifies the communes that will be affected by the installation.

After the Inspection for Classified Installations has checked that the application is complete and acknowledges receipt[10], the Prefect names a Commissioner-in-Chief who will conduct a public enquiry. The public enquiry allows parties that are affected by the refuelling station ('the public') to raise their concerns. In parallel, the city council and state services can raise objections, if any. The Commissioner-in-Chief draws up a report of the public enquiry, which is sent to the applicant.

The applicant has the opportunity to reply to the public enquiry report. The Commissioner-in-Chief then submits the result of the public enquiry to the Prefect (Inspection for Classified Installations) who registers the result.

In the next two steps of the procedure, two authorities provide advice on the application. First, the Inspection for Classified Installations produces an advice. This advice is sent to the Departmental Council of Health (Conseil Départemental de l'Environnement et des Risques Sanitaires et Technologiques, CoDERST), who subsequently provides the Prefect with an advice on refusal/approval.

Based on the inputs of the Inspection for Classified Installations and the CoDERST, the Prefect issues a draft order. This order stipulates the technical requirements that the installation has to meet. The applicant then has the opportunity to submit written observations on this draft order. Taking into account these observations, the Prefect

[9] More information on ICPEs and approval procedures can be found at http://installationsclassees.ecologie.gouv.fr/.

[10] The Inspectorate can contact the applicant directly for information – it is therefore recommended to contact the Inspectorate prior to submitting the application.

issues its final Order on the approval/refusal of the operational permit and stipulating the technical requirements for the installation.

The procedure for the **building permit** is considerably less complex. The application for the building permit needs to include the receipt acknowledgement of the application for the operational permit and may therefore only start after the operational permit procedure has been initiated. The Prefect will issue a decision on the building permit after the public enquiry has been completed.

Lead time

The procedure for the operational permit determines the total lead time – the procedure for the building license can be done in parallel, not influencing total lead time. This section will therefore focus on the lead times in this procedure.

Some steps in the procedure have stipulated lead times. The acknowledgement of the receipt of the application file for the operational permit (including a verification of completeness) should take place within two months. Furthermore, the public enquiry should take one month, possibly extended with a 15-day period. Finally, the steps in the procedure following the public enquiry may take a maximum of three months.

The total lead time for Installations Classées is approximately 10-12 months[11]. However, the experience with hydrogen refuelling stations in France is limited, so that the actual procedure may take longer. 10-12 months should be considered a lower limit.

[11] Source: http://installationsclassees.ecologie.gouv.fr/What-procedure-is-to-be-followed.html.

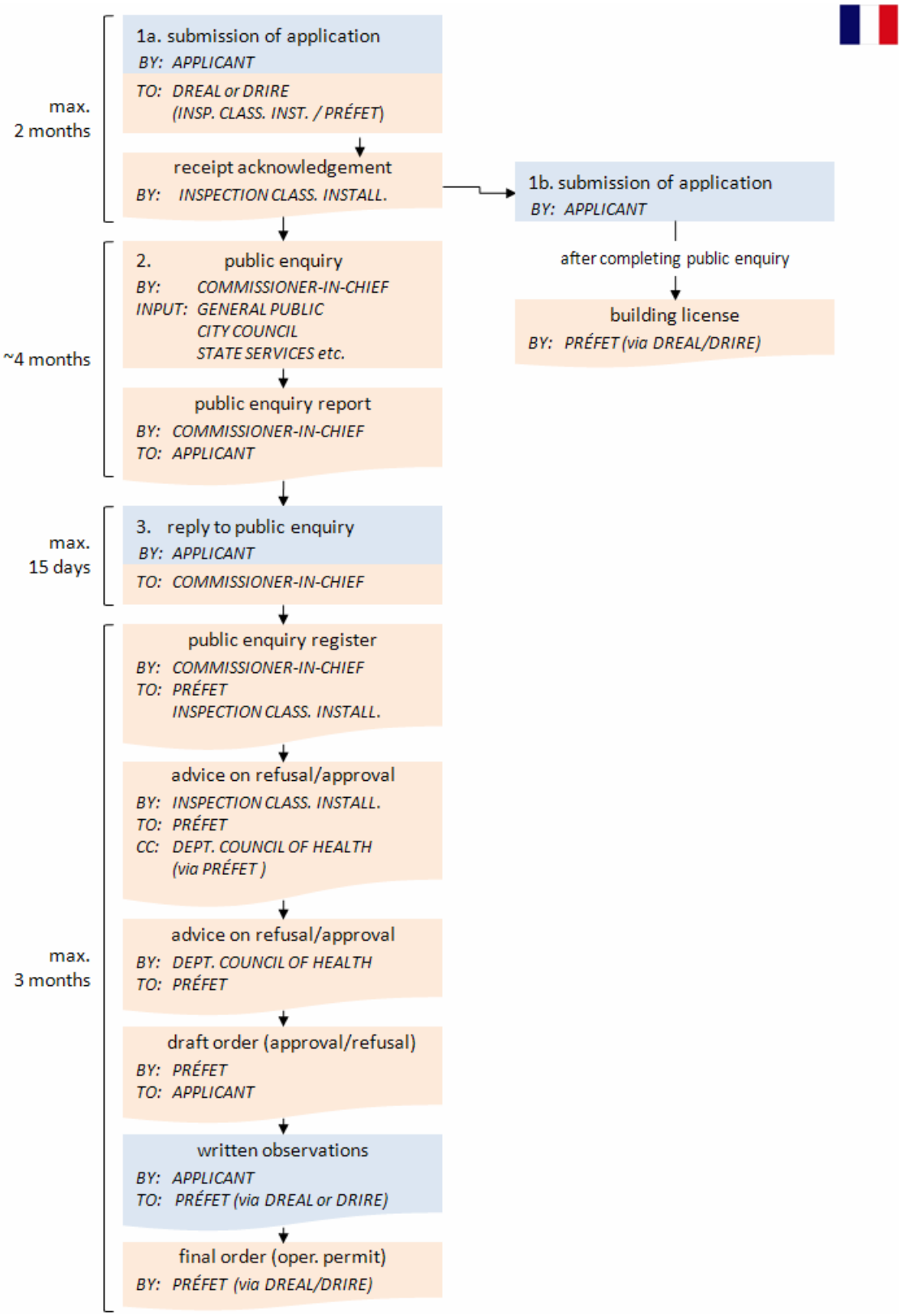

Figure 3.2 *Approval procedure in France. This figure is based on HyApproval (Air Liquide DTA (ed.), 2008) and refined with the outcome of interviews*

3.3 Austria

There is no regulation specific for hydrogen refuelling stations in Austria. Therefore, the requirements are based on the standard for CNG (ÖVGW G97).

Procedure

Figure 3.3 is a schematic representation of the approval procedure for a hydrogen refuelling station in Austria. The procedure is quite straightforward, consisting only of two basic steps.

After preparation and submission of the application, the first step is assessment and approval by the responsible department at the Trade Office. This approval allows the applicant to construct the refuelling station. In the second permitting step, a notified body needs to carry out an inspection of the installation. Upon successful completion of this inspection the Trade Office will issue an announcement on the completion of the commissioning and operation may commence.

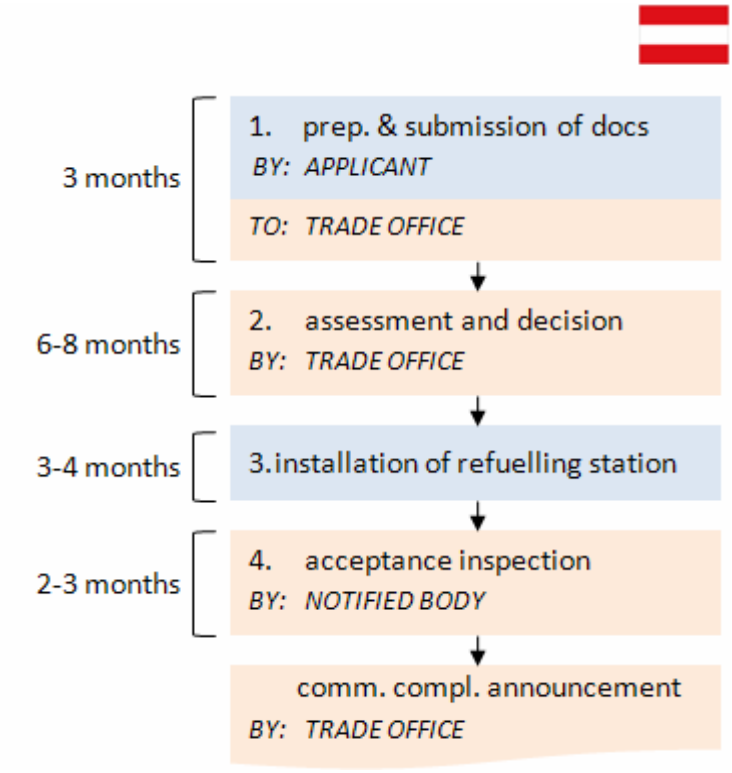

Figure 3.3 *Approval procedure in Austria. This figure is based on HyApproval (Air Liquide DTA (ed.), 2008) and refined with the outcome of interviews*

Lead time

The assessment of the application and the decision by the trade office will take approximately 6-8 months. The acceptance inspection and the decision to allow operation takes approximately 2-3 months. The total lead time for the process is approximately 8-11 months.

These lead times are expected to decrease when the organisations involved gain more experience with hydrogen refuelling stations. It is estimated that the lead time for the entire process (including preparation of the application and station commissioning) can be reduced to 4-6 months.

3.4 Italy

For the operation of a public hydrogen refuelling station in Italy, a building permit and an operating permit are required. The first hydrogen refuelling station in Italy was built in the framework of the Zero Regio project. At the start of this project, the procedure and requirements for the refuelling station was not very clear (Sapio & Infraserv, 2006).

Since then, a new Decree[12] that covers hydrogen refuelling stations has been adopted. This decree significantly clarifies requirements, as experienced in the refuelling station for hydrogen-methane mixtures, opened in Assago (Milano) in the framework of the project My-Gas in February 2010. However, there are also drawbacks. Safety distances under the new decree are 50% larger than in the previous regulation and are larger than in other European countries. A further peculiarity is that although hydrogen refuelling stations are allowed to offer hydrogen at a pressure of 350 bar, vehicles are not allowed to store hydrogen at pressures over 200 bar.

Procedure

Figure 3.4 provides an overview of the approval procedure in Italy. The first step is the preparation and submission of the application file. This application file includes the station layout and the design of the civil works[13]. The risk analysis needs to be included in case of on-site hydrogen production or in case any legal requirement is not fulfilled. In the Zero Regio case a risk analysis was required.

[12] Decreto 31 agosto 2006: Approvazione della regole tecnica di prevenzione incendi per la progettazione, costruzione ed esercizio deglli impianti di distribuzione di idrogeno per autotrazione.

[13] For a complete list of the files submitted, please refer to D4.7 of the Zero Regio project.

The application is submitted to the competent office of the Town Hall. This office forwards the application for advice to the Regional Trade and Fuel Office, the Technical Revenue Office, the Provincial Health Service, the Regional Environmental Protection Agency, and the Regional Fire Brigade. After these authorities have provided advice, a conference of services is held. The City Council takes the outcome of this conference into account in its decision on the issuance of the building permit. Construction of the refuelling station may start once the building permit has been obtained.

After construction, the Provincial Health Service and the Fire Brigade carry out a start-up inspection. If all requirements are met, the Fire Brigade issues a Fire Prevention Certificate (CPI). The City Council then issues the operating licence, after which operation may commence.

Lead time

The lead time for the preparation of the application is dependent on whether a risk analysis needs to be carried out (i.e. in the case of on-site production or non-compliance with legal requirements). A risk analysis will add 2 months to the lead time, bringing the total to approximately 3-4 months.

The lead time for granting the building permit is approximately 6 months. This compares to approximately 3 months for the procedure for a conventional refuelling station.

The start-up inspection and the granting of the operational permit takes about 40 days. The total lead time for the permitting procedure (i.e. excluding preparation of the application and the station commissioning) adds up to about 7-8 months.

It is expected that the lead times could be reduced somewhat due to increasing familiarity with hydrogen as an automotive fuel. The procedure for granting the building permit (steps 2 and 3 in Figure 3.4) could as a result be shortened by about 3 months (comparable to a conventional refuelling station). The total lead time would then be reduced to approximately 4-5 months.

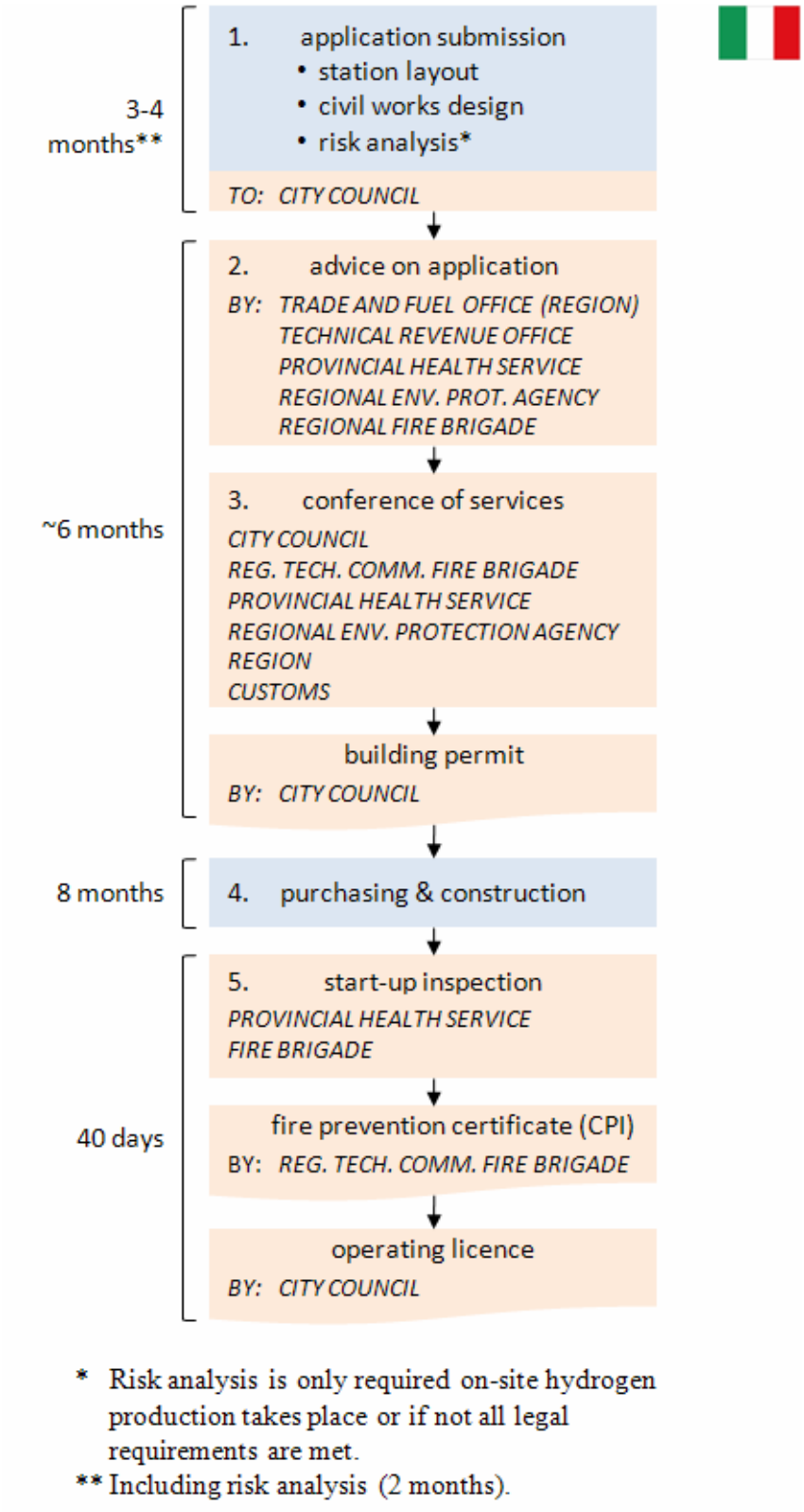

Figure 3.4 *Approval procedure in Italy. This figure is based on HyApproval (Air Liquide DTA (ed.), 2008) and refined with the outcome of interviews*

3.5 Norway

In Norway, a permit issued by the local government (municipality) is required for the construction and operation of a hydrogen refuelling station. A risk assessment must be included in the application. This risk assessment should be based on national rules and guidelines.

Procedure

The approval procedure is very straightforward (Figure 3.5). First, a hydrogen refuelling station should be inserted in the county area plans. The applicant needs to request this change at the municipality.

Then, the plans for the refuelling station itself are submitted to the municipality. The application includes a risk assessment by a specialised firm. If all requirements are met, the municipality will issue the required permit.

Then, the applicant should notify the Directorate for Civil Protection and Emergency Planning that a hydrogen refuelling is to be built. An online tool is available for this purpose.

Hydrogen refuelling stations that intend to sell hydrogen on a commercial basis should obtain approval from the National Metrology Service (not included in Figure 3.5). A standard for measuring hydrogen is not available yet, hampering the commercial sale of hydrogen in refuelling stations. This does however not affect hydrogen stations built for demonstration purposes only.

Lead time

The request to change the county area plans currently takes approximately 1-3 months. The assessment of the application and the subsequent issuance of the permit by the municipality takes approximately 2-6 months. Total lead time for the approval procedure of a hydrogen refuelling station in Norway is therefore currently 3-9 months.

More experience with hydrogen refuelling stations may reduce lead times. It is estimated that the lead time for the change of the county area plans can be brought down to approximately 1 month. This would reduce the lead time of the entire procedure to approximately 2-7 months.

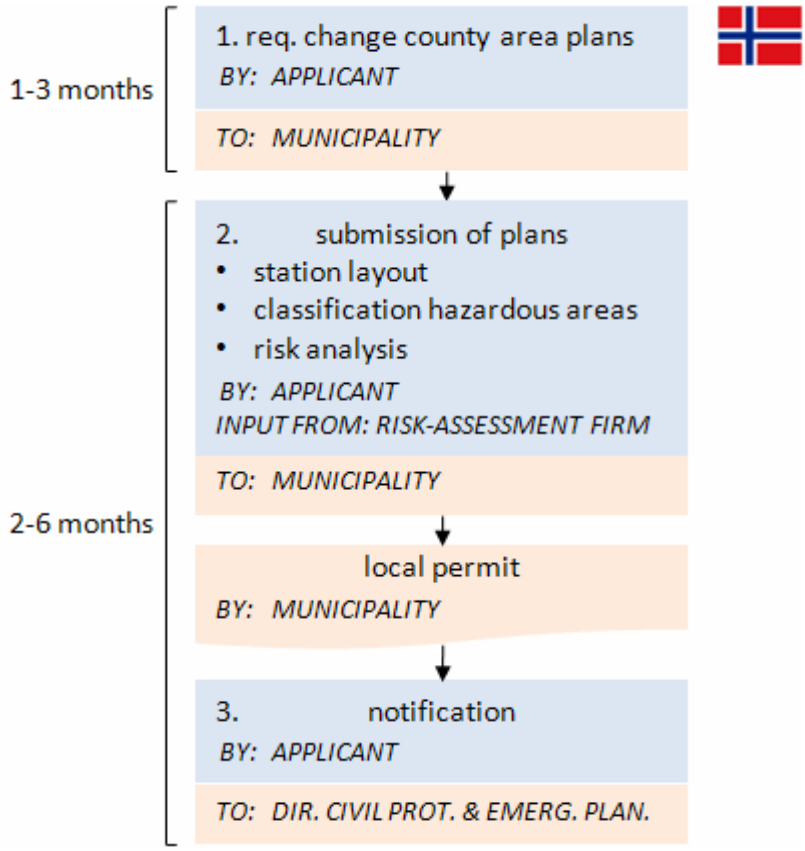

Figure 3.5 *Approval procedure in Norway. This figure is based on HyApproval (Air Liquide DTA (ed.), 2008) and refined with the outcome of interviews*

3.6 The Netherlands

Constructing and operating a hydrogen refuelling station in the Netherlands requires an environmental permit, which includes a building permit. Required specifications for hydrogen refuelling stations are not set down in regulations, but a national guideline specific for hydrogen refuelling stations (NPR 8099) provides a common basis to work from for all actors involved. Although this is useful, the provisions in the permit still need to be tailored to the specific situation of each refuelling station.

Procedure

The approval procedure (Figure 3.6) starts with a consultation between all actors involved. The applicant then prepares and submits the application to the environmental department of the local authority. This department assesses the application, assisted by the regional fire department on external safety matters. In this assessment, the local authority establishes what the conditions are under which the permit will be granted. These conditions are annexed to the permit, which is

issued to the applicant. The applicant may then commission the station, taking into account the requirements established by the authorities.

Lead time

By law, the maximum period for the preparation and issuing of the environmental period is 6 months. This period can be extended by 6 weeks in case of a complex application.

In the Netherlands, one hydrogen station has recently been opened (Arnhem). The permit for this station was granted in six months. It is estimated that the procedure could be completed somewhat faster if regulations would be more standardised, e.g. when dedicated regulations for hydrogen would be available.

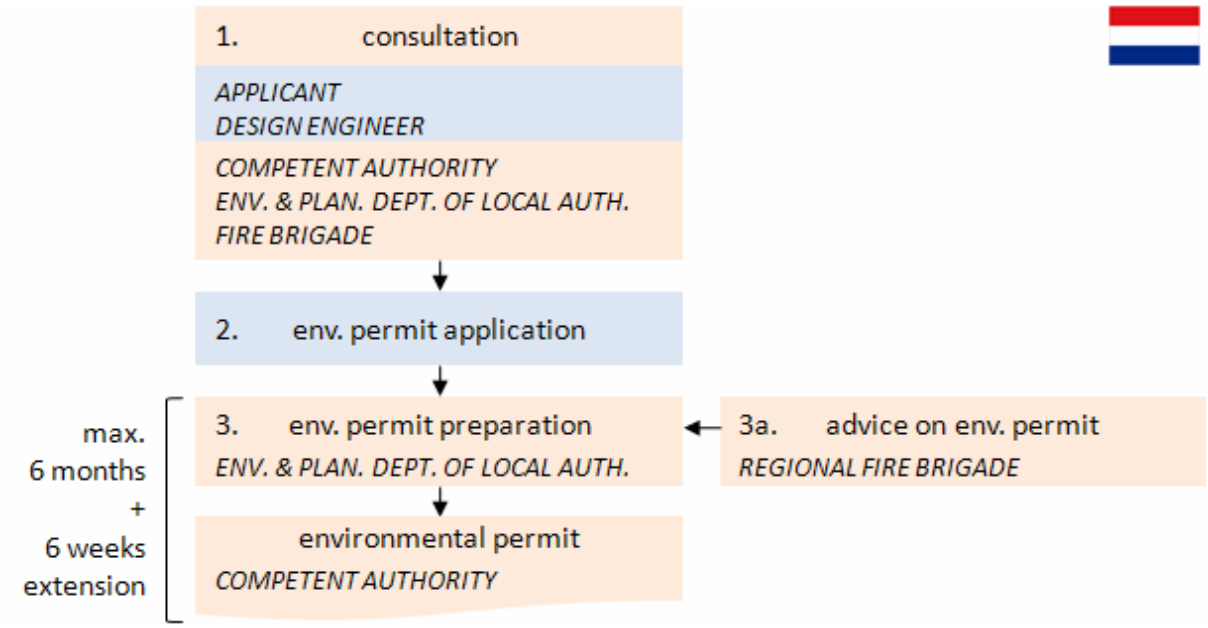

Figure 3.6 *Approval procedure in the Netherlands. This figure is based on HyApproval (Air Liquide DTA (ed.), 2008) and refined with the outcome of interviews*

4 Regulation for hydrogen vehicles

Regulation for hydrogen vehicles is decidedly less complex than regulation for hydrogen infrastructure. In 2009, Regulation 79/2009, covering the type-approval of hydrogen-powered motor vehicles, was adopted.

This regulation details the requirements for hydrogen vehicles and makes it possible for manufacturers to have their vehicles approved for use on the public road. As a Regulation does not need implementation in member state law, the type-approval of hydrogen vehicles is now taken care of for the entire EU.[14]

This chapter will explain how the type-approval system works and what the scope of Regulation 79/2009 is.

4.1 The EU type-approval system

Directive 2007/46/EC provides the framework for the European whole vehicle type-approval. In this framework, a car manufacturer applies for the type-approval of a vehicle model at the appropriate national authority.

Figure 4.1 provides an overview of the type-approval process. The application is assessed based on the applicable regulations and guidelines (e.g. Regulation 79/2009 in the case of hydrogen vehicles) and the test report of an accredited test organisation. If the vehicle model meets the requirements, type-approval will be granted.

One of these requirements is Conformity of Production (COP). COP implies that the production process is checked to ensure that vehicles produced with the process will meet the requirements for type-approval. The approval authority issues a Compliance Statement as proof of COP.

The vehicle type-approval and the Compliance Statement enable the registration and sale of vehicles in any country in the EU-27. The type-approval authority that has approved the vehicle will inform the type-approval authorities in other countries. The type-approval process therefore needs to be applied in only one EU Member State.

[14] Some peculiarities in national law may remain. For example, in Italy, storage of hydrogen at pressures over 200 bars is not allowed.

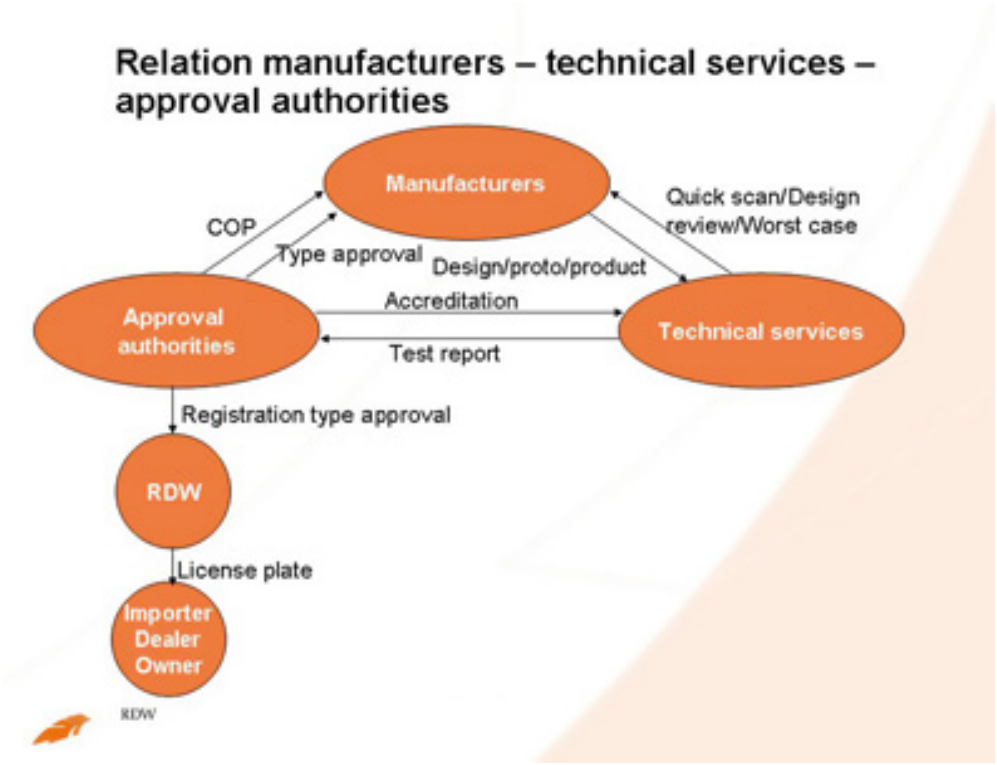

Figure 4.1 *Type-approval procedure (source: RDW[15])*

4.2 Scope of Regulation 79/2009

Within this framework for type-approval, Regulation 79/2009 covers requirements for hydrogen-powered vehicles of the categories M and N. Vehicles of category M are 'motor vehicles with at least four wheels designed and constructed for the carriage of passengers'. Vehicles of category N are 'motor vehicles with at least four wheels designed and constructed for the carriage of goods'.

The Regulation covers the following aspects:

- Obligations of manufacturers
- General requirements for hydrogen components and systems
- Requirements for hydrogen containers and components, for both liquid and gaseous hydrogen
- General requirements for the installation of hydrogen components and systems

In addition, the Regulation introduces penalties for non-compliance.

[15] The Rijksdienst voor het Wegverkeer (RDW) is the Dutch type-approval authority. See http://tgk.rdw.nl/en/engelse_tgk_site/type_approval_process/ for more information on the type-approval procedure.

5 Summary and conclusions

Hydrogen demonstration projects need to meet certain regulatory requirements. These regulatory requirements relate both to vehicles and infrastructure (refuelling stations).

Of these two, regulatory requirements for **vehicles** form the lesser barrier. Regulation 79/2009 has incorporated hydrogen vehicles in the EU-wide whole vehicle type-approval framework, streamlining the type-approval of hydrogen vehicles.

Approval procedures for **hydrogen infrastructure** ensure acceptable safety levels and minimise impact on the environment. They also claim resources in the project and impact lead times. Approval procedures are not (yet) harmonised across Europe. Consequently, the FCH JU and project partners in hydrogen demonstration projects have an interest in selecting countries that have a favourable, i.e. relatively brief and simple approval procedure.

The analysis done for this report revealed that Germany and the Netherlands have the most favourable approval procedures, closely followed by Norway and Austria. Compared to the procedures in these countries, the procedures in Italy and France could benefit from more clarity (in terms of specific requirements for hydrogen stations) and – especially in the case of France – simplification (in terms of steps in the procedure and the number of authorities involved).

Lead time in **Germany** is relatively short, the procedure is straightforward and specific guidelines for hydrogen are available.

The situation in **the Netherlands** is similar to that in Germany. Lead times are comparable and the Netherlands also has hydrogen-specific national guidelines (although not legally formalised). The procedure is straightforward and handled by a single authority.

Norway has a short lead time (albeit with quite a large uncertainty) and a very straightforward procedure. The information requirements in the procedure are based on national regulations and guidelines, which are not hydrogen-specific. Hydrogen-specific regulations and guidelines would make the requirements for a station clearer.

The situation in **Austria** is also relatively favourable. Main strength of the Austrian procedure is simplicity. Although the lead times in Austria are currently quite long, significant reductions are expected when more experience with hydrogen will be developed. Austria does not yet have hydrogen-specific guidelines in place.

The lead time of the approval procedure in **Italy** is comparable to that of the previous three countries. Substantial reduction is expected when experience is gained with hydrogen. However, the procedure also proved to be complex. New, hydrogen-

specific regulations have recently been adopted that possibly improve the Italian approval procedure. Future projects and experiences will tell whether the new regulation is indeed an improvement.

The approval procedure in **France** is based on regulation for industrial plants with hydrogen-related activities. Expected lead times are relatively long and it is unclear whether more experience with hydrogen refuelling stations will reduce lead times. The procedure is complex and involves many authorities, as well as the public.

As argued in the project HyApproval, a European Regulation may simplify the current situation for hydrogen refuelling station approval procedures in Europe. As long as that situation is a desire rather than reality, partners intending to deploy a hydrogen demonstration project will have to monitor and follow nationally defined approval procedures.

In the past decade, the various actors have gained experience with how to interpret national guidelines, leading to more knowledge and reduced lead times. It can be expected that this process will continue and that the approval for a hydrogen refuelling station will eventually be no more complex than the procedure for a regular station.

References

Air Liquide DTA (ed.) (2008): *Handbook for Hydrogen Refuelling Station Approval*. HyApproval D2.2, 2008.

Backhaus, J. & I.G. Bunzeck (2010): *Planning and permitting procedures for hydrogen refuelling stations*. ECN-E--10-051, ECN, Amsterdam, 2010.

Sapio & Infraserv (2006): *Development and Demonstration of Infrastructure Systems for Hydrogen as an Alternative Motor Fuel*. Zero Regio D4.7, 2006.

Appendix: Interviewees

Name	Country	Affiliation
Mr Boris Jermer	Germany	HyCologne
Dr Bastien Affeltranger	France	INERIS
Mr Ewald Wahlmüller	Austria	Fronius
Mr Manfred Klell	Austria	HyCentA
Mr Davide Damosso	Italy	Environment Park
Dr Sandro Sutti	Italy	Comune di Mantova
Mr Bjørn Simonsen	Norway	Institute for Energy Technology
Mr Bertus Vooijs	Netherlands	Gemeente Arnhem