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WP6 – "Business Models, Regulatory Framework and Route for Replication"

D6.1 – "Identification of current business models, permitting and operating parameters of temporary gensets towards future marketability of Everywh2ere Solutions"

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Executive Summary

EVERYWH2ERE “D6.1 Identification of current business models, permitting and operating parameters of temporary gensets towards future marketability of Everywh2ere Solutions “ has the aim to analyse current business model, permitting and authorization processes and all the non-technical aspects related to the rental and procurement of generators in constructions sites, music festivals and urban temporary events. A specific focus is performed on typical behaviour of local authorities in this framework in order to identify how to leverage public stakeholders involvement towards the spreading of the EVERYWH2ERE Gensets.

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Abbreviations and acronyms

ADR	alternative dispute resolution
ATEX	ATmosphere Explosive
DSO	Distribution system operator
EED	Electric Equipment Directive
EIA	Environmental impact assessment
FC	Fuel cell
FCH	Fuel cell hydrogen
FF	Fire fighters
GDP	Gross domestic product
INAIL	Istituto nazionale Assicurazione Infortuni sul Lavoro
ISO	International Organization for Standardization
ISPESL	Istituto Superiore per la Prevenzione e la Sicurezza del Lavoro
LoC	Letter of committment
LPG	Liquid petroleum gas
NFPA	National Fire Protection Ass.)
NNRM	Non-Road Mobile Machinery
OSHA	Occupational safety and health standards
PEM	Proton exchange membrane
PEMFC	Proton exchange membrane fuel cell
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RES	Renewable Energy Systems
SEA	Strategic Environmental Assessment
SFfC	Strategic Forum for Construction

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1. Introduction

This public report is part of H2020-FCH-JU project "EVERYWH2ERE - Making Hydrogen affordable to sustainably operate Everywhere in European cities" and it was prepared within the framework of Work Package 6.

EVERYWH2ERE aims to demonstrate the reliability of using FC technologies in temporary power gensets replacing current state-of-the-art solutions mostly based on diesel engines, thus opening a niche but relevant market for FC technologies. During the whole project 8 PEMFC (4x25 kw and 4x100 kW) equipped containered "plug and play" gensets will be realized and tested through a pan-European demonstration campaign in a demonstration to market approach. The prototypes will be tested in construction sites, music festivals and urban public events all around Europe, demonstrating their flexibility and their.enlarged lifetime. Demonstration results will be widely promoted and they will be helpful for the promotion of replicability studies (for the use of gensets in further end-user contexts) and for the definition of a commercial roadmap and suitable business model for the complete marketability of the gensets within 2025

This deliverable was prepared within the framework of WP 6 – Business Models, Regulatory Framework and Route for Replication.

Starting from the description of demosites presented in WP1, current business model, permitting and authorization processes and all the non-technical aspects related to the rental and procurement of generators in constructions sites, music festivals and urban temporary events will be analysed, identifying the stakeholders (rental companies, DSOs etc.) involved in this value chain also thanks to the support of IREN SPA (as ENVIPARK linked 3rd Party). A specific focus will be performed on typical behaviour of local authorities in this framework in order to identify how to leverage public stakeholders involvement towards the spreading of the EVERYWH2ERE Gensets.

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2. The role of Fuel Cell in the future temporary power gensets scenarios

As mentioned in the FCH-JU MAWP, "The EU is committed to transforming its transport and energy systems as part of low-carbon economy by 2050, whilst decoupling economic growth from resource and energy use, reducing GHG emissions, increasing energy security and maintaining a strong competitive global position": the development and demonstration at urban level of affordable transportable FC gensets goes in this direction, promoting a cross-cutting technology which capitalize the EU FCH expertise from both transport and energy sectors, promoting energy security through a zero emission technology and intercepting new potential stakeholders and end-users from two crucial EU economic sectors: Temporary and transportable power market based on fuel cell technology have experienced a significant surge in interest because they offer technical and environmental benefits.

During the EVERYWH2ERE workshop: Upscaling Hydrogen Gensets in European Citie, the "EVERYWH2ERE City Stakeholders' Group Launching Event", held in Brussels on 15th January, one of the outcomes has been that *some cities in EU are now promoting the introduction of low carbon construction power supply into public tendering as one of the decision making/ranking voices, thus promoting innovative gensets or energy grid connection where contracts guarantee Renewable origin of their electricity.*
The Annex I reports the presentation by the EU Commission on "Clean Air in Europe: challenges and EU Policy". Europe's air quality is improving with a big impact on health, environment and costs.
The traditional generators are small but significant source of air pollution. Estimated inventory emissions vary largely across member states; generator sets could amount to up to 50% of total NRMM emissions of NOx, 20% of PM (with NRMM amounting to ~1/10th of total fuel use for road applications).
Policy is working hard on this aspects, the NRMM Regulation (Regulation (EU) 2016/1628 and associated acts) defines emission limits for NRMM engines for different power ranges and applications. It also lays down the procedures engine manufacturers have to follow in order to obtain type-approval of their engines – which is a prerequisite for placing their engines on the EU market.
With the new NRMM regulation, new generator sets are subject to strict emission standards for CO, VOC, NOx and PM.
Generator sets make a significant contribution to air pollution. The latest NRMM regulations will drive the adoption of better aftertreatment technologies (notably particulate filters) in new equipment from 2019.
According on these interesting inputs the H2 gensets are good alternative to the traditional one, in order to reach reduction of emissions and pollution.

The market is currently served by diesel generators (gensets). Mainly gensets are used in events where up to two or three days of power outage is needed. Diesel gensets generate pollutants and significant CO2 emissions, noise problems during their operative conditions and presents high maintenance costs due to mechanical issues and variability of fuel costs.

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Traditional companies, involved in the providing power in places where energy is not always certain and obvious, have already focused their business on new innovative, sustainable and efficient technologies based on fuel cell such as Bredenoord[1]. They propose two prototypes (5kVA and 17,5 kVA) based on PEM fuel cell with hydrogen in tanks at 200bar (dimensions 2.5x1.25x2.1 m).

Specific projects and research activities have demonstrated the fuel cell systems are more efficient than the diesel generators. The Maritime Hydrogen Fuel cell Project started in August 2015 with the support of the U.S. Department of Energy's Fuel Cell Technologies Office and the U.S. Department of Transportation's Maritime Administration is a pilot project that will replace a diesel generator currently used to power refrigerated containers in the Honolulu commercial port (Hawaii) with a containerized 100 kW Hydrogenics fuel cell genset[2] [3].
Natural disasters such as earthquakes, storms, wildfires hurricanes every year leave households, hospital and infrastructures without power.
Traditionally the mainly technologies used are diesel or petroleum gensets, however due to advances in technologies, alternative energy solutions are becoming more available and are considered a mature alternative to the traditional gensets. In Japan the fuel cell systems are supplying emergency power to home and hospitals.
During the Hurricane Sandy five sites operated proving power for cell towers with fuel cell backup systems provided by Altergy Systems and UTC Power. While many of the diesel, propane and battery cell phone tower backup generators were affected by the storm, all of the cell towers powered by fuel cells ran without any issues — allowing many disaster victims to continue accessing their cell phone network[4].
In 2015 the backup and remote power fuel cell markets continued expanding into India in cooperation with the main telecommunication companies, as well as in other parts of the world. Specific agreement were entered between fuel cell manufacturers and Indian telecommunications company: Ballard Power delivered ElectraGen™-ME systems by Reliance Jio Infocomm Ltd and ElectraGen™-H2 systems to Aditya Birla; around 70% of GTL's telecom towers will be transformed from diesel power to hydrogen fuel cells throughout the contracts with Intelligent Energy.
GenCell, the Israel-based fuel cell developer and manufacturer, has announced a strategic partnership with San Diego Gas & Electric (SDG&E), a leading North American energy company. The San Diego-based energy company has been working alongside GenCell over the last year to test how fuel cells can contribute to the company's efforts to be the cleanest, safest, most reliable energy company in America.

[1] https://www.bredenoord.com/en/rental/specials/fuel-cell-generator-purity/
[2] Fuel cell technologies market report 2015, U.S. Department of Energy
[3] http://energy.sandia.gov/transportation-energy/hydrogen/market-transformation/maritime-fuel-cells/maritime-hydrogen-fuel-cell-project/
[4] Fuel cell technologies market report 2015, U.S. Department of Energy

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2.1 Temporary Events, Music Festivals and Fairs

This is a growth sector in EU countries with an yearly increasing of 3,6%[5]. Furthermore, temporary events (such as music festivals and fairs) are becoming more and more sensible to reduce their impact (noise and pollution) also through the exploitation of RES, promoting these topics to general audience. Mainly, there is increasing demand for sustainable energy at such events in The Netherlands, Germany, Denmark, and the UK.
In past years there have been events where electricity was produced using fuel cell generators, here some of the most interesting are reported:

1. In 2010th, Lowlands Music Festival, Biddinghuizen (The Netherlands) and Glastonbury Festival (UK) and at three smaller festivals in the London area allowed to provide power through a hydrogen fuel cell generator developed by Nedstak and Bredenoord[6,7,8].
2. In 2008th, in the Arcola Theatre (London, UK) the whole lighting rig was powered with a 5kW fuel cell, using low energy lighting fixtures. In 2009 the tent grew to its present size, but, with a smaller stage and audience on fewer sides, we were just about able to power the rig on 5kW, with a little extra generator power for particularly bright scenes.
This lighting rig gives designers an opportunity to trial these technologies[9].

3. In 2012th, during the Green Man Festival, Wales (UK), a PEM FC genset designed by Gordon Murray Design and developed by BOC, provided 8 kW of clean energy power for the stage, sound and lighting in the Omni-Tent[10].
4. London H2FC Supergen Summer Social BBQ, August 2013, Hydrogen & Fuel Cell researchers from across the capital enjoy some burgers, beer and zero-emission music powered by a 10 kW PEMFC-supercapacitor hybrid power generator developed by students and researchers at Imperial College[11].

The concept of sustainability in the event sector is increasingly important. The development of internationally recognized frameworks such as ISO 20121 and the Event Organizers Sector Disclosures provide the sector with guidance on how to report, and manage, sustainability performance. Stakeholder expectations for transparency and requirements for sustainability disclosure are increasing. An event organizer's management approach and business practices are particularly important because of the perception by some stakeholders that organizations are not transparent about all practices.
Some specific environmental Guidelines for sustainable events are developed, they are mainly focused on Environmental innovation investing in sustainability practices helps to promote innovative techniques and technologies that help to utilize resources in the most efficient way.

[5] Opportunities for Growth in the UK Events Industry Roles & responsibilities, EVENTS INDUSTRY FORUM,201
[6]http://www.renewableenergyfocus.com/view/11904/bredenoord-hydrogen-fuel-cell-generator-for-sustainable-energy-at-lowlands-festival/
[7]https://fuelcellsworks.com/archives/2010/08/20/bredenoord-supplies-festivals-with-sustainable-fuel-cell-energy/
[8] http://science.gaeatimes.com/2010/08/20/lowlands-festival-2010-powered-by-hydrogen-fuel-generator-21120/
[9] http://www.sustainablepractice.org/tag/arcola-theatre/
[10] http://blogs.ucl.ac.uk/events/2012/08/24/hydrogen-fuel-cell-vs-diesel-generators-at-the-greenman-festival/
[11]http://www.h2fcsupergen.com/events/project-hydrogen-fuel-cell-rock-band-debut-at-the-london-h2fc-supergen-summer-bbq/

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However, each event is an opportunity to spread awareness among participants, employees, suppliers and local communities about benefits of eco-friendly products and services. In this way sustainable and responsible behaviours are promoted[12,13,14.15].
Some important points show how event and festival sector has a unique opportunity to contribute to carbon reduction. The UK events sector used in the region of 12 million liters of diesel in 2011 and the power is generally one of the five largest single production costs for a festival. Power can represent up to 70% of an event's 'core' carbon footprint (core excludes audience travel and transport).
In addition, fuel costs are rapidly rising, and the energy market is forecast as increasingly volatile. Initial research suggests that inefficient generator use is common at events in the UK. The main cause of fuel wastage is lack of information about requirements and lack of communication between contractors and festivals, festivals and suppliers.
The fuel cell gensets find great interest in this area that is increasingly growing.

2.2 Construction sites

With 3 million enterprises and a total direct workforce of 18 million people, the construction sector contributes at around 9% to the GDP of the European Union. As from 2015 the construction industry seems on the path to recovery, according to EUROSTAT-EUROCONSTRUCT data[16]. Eurostat registers an increase of 2.3% in production in construction in the EU-28 in February 2016, compared with February 2015. This is due to building construction rising by 2.9%. This sector is becoming year by year more sensible to sustainability and energy efficiency, not only of the building themselves, but also for what it concerns the construction phase where LEED and BREAM protocols already take care of energy supply sustainability and where a more rational use of energy will be able to avoid about 5 Mtons of CO2 per year[17]. In fact, energy and fuel used on construction sites accounts up to approximately 33% of total emissions according to some National construction industry analysis[18].
Some specific environmental guidelines for sustainable constructions and programme of work supporting the construction industry in order to reduce waste, emissions and improving resource efficiency are developed[19].

[12] UNEP (United Nations Environment Programme), "Green Meeting Guide 2009-Roll out the Green Carpet for your Participants", 2009, http://www.uneptie.org/shared/publications/pdf/DTIx1141xPA-GreenMeetingGuide.pdf
[13] UNEP (United Nations Environment Programme), "Sustainable Events Guide-Give your large event a small footprint", 2012, http://www.ecoprocura.eu/fileadmin/editor_files/Sustainable_Events_Guide_May_30_2012_FINAL.pdf
[14] http://www.yourope.org/en/gointroduction
[15] http://www.environmental-handbook.com/
[16] http://www.ebc-construction.eu/index.php?id=3
[17] Carbon: Reducing the footprint of the construction process, July 2010, Carbon Trust

[18] http://www.wrap.org.uk/category/sector/construction
[19] http://www.wrap.org.uk/category/sector/construction

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The Strategic Forum for Construction (SFfC) has produced a guide in order to give some actions to decrease carbon emissions on construction sites, interesting aspects are related to manage energy in a site office efficiently and produce low CO2 site accommodation[20,21].

The fuel cell gensets find great interest in these areas that is increasingly growing.

[20] Strategic Forum for Construction (SFfC) 2010 carbon Assessment Report
[21] http://www.greenconstructionboard.org/otherdocs/CO2%20Construction%20sites%20master.pdf

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3. Current Business model

The main references come from D1.1 – Test Site Description and requirements for EVERYWH2ERE gensets specification, which reports deep details on gensets in construction sites and Events identified.

Generators can be rented easily and cheaply from a very big amount of rental companies all over Europe and worldwide: normally construction companies are linked to local rental companies that can easily provide maintenance services.
Here below current Companies and technologies used for providing traditional power/renting gensets already contacted or to be contacted during the project:

RENTAL COMPANY	market (EU, worldwide=ww)	URL	FC market
Aggreko	ww	https://www.aggreko.com	
Bredenoord	ww	https://www.bredenoord.com/en/	https://www.bredenoord.com/en/rental/specials/fuel-cell-generator-purity/: Ther are two prototypes (5 kVA and 17,5 kVA) available that can be used for marketing purposes.
Firefly	uk	http://www.fireflyhybridpower.com/	
Tangent	uk	https://tangent.energy/	
Powerline		https://www.thepowerline.co.uk/	
The Powershop		http://thepowershop.eu/	
ZAP		http://www.zapconcepts.com/en/	
Boels		https://www.boels.de/	
EDMI International Machinery		http://www.edmi.es/index.php	
ATLAS COPCO	ww	https://www.atlascopco.com/es-es	
BARLOWORLD FINANZAUTO (Dealer of Caterpillar Inc)		http://www.finanzauto.es/es/	
CGT_Caterpillar	ww	https://www.cgt.it/en/application/temporary-events-and-public-services	
Energy rental		http://www.energyrental.it/en/rental-power-generators/	

Table 1. Rental gensets companies

They deal with different sizes of generators from 20 kW to MW scale.
There are three main groups of generator sets used:

- Small units (output of 0.5 to 5 kW) powered by four-stroke engines (some spark ignition)
- Medium sized units (5-100kW can be put on a small trailer). 3 or 4 cylinder diesel engines
- Large generators sets 100 to 1000 kW, small containerized, small power plant. Diesel turbo charged engines

FHA contacted local generators rental companies who provided information about rental prices for one and two months (information here in table below).

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APPROXIMATED RENTAL PRIZE					
Rental period	ONE MONTH				
Prize per	CALENDAR DAY				
Working regime / Machine	24 hours/day	8 hours/day	Standby	Extra hour	secure
Genset 40kVAs	76 €	48 €	34 €	3 €	6%
Genset 100kVAs	109 €	69 €	49 €	5 €	6%

Table 2. Diesel gensets rental prices in EU

Costs could decrease of around 10-15% in case of usage period longer than one month.

The fuel costs are aside.
Looking to the an overview of last five years diesel prices together with an estimation (realized with local rental companies' support) of State of The Art Gensets performances, in order to potentially evaluate the fuel operation costs of diesel gensets for benchmarking. The costs fluctuate between 1,2 and 1,2 €/l.

Fuel consumption	8.5 kW	30 kW	100 kW
100% workload	2.6 l/h	7 l/h	21.7 l/h
75% workload	2 l/h	5.2 l/h	16.5 l/h
50% workload	1.5 l/h	3.8 l/h	11.7 l/h

Table 3. Data from Atlas Copco

Fuel consume	40 kW		100 kW	
Frequency	50 Hz	60Hz	50Hz	60Hz
100% workload	9.5 l/h	-	24.1 l/h	28 l/h
75% workload	6.3 l/h	-	18.5 l/h	26 l/h

Table 4. Data from Barloworld Finanzauto

The Event/festival has a contract with an energy company, which is then responsible for powering the event for a short period. The energy company rents different generator for the needs of the different stages, camp sites, back stages, catering areas, commercial areas or production facilities. Contracts normally established are often "all inclusive" except for the fuel costs which are aside: rental of the gensets/equipment, transport A/R, installation, testing, on-site assistance of one or more technicians, disassembly, supply of fuel which is paid.

The construction company has an annual/multi annual contract with an energy Company. Construction companies often rent gensets for back-up/emergency power supply, not only for direct power supply, so there is the possibility that the gensets are rented but experience zero or low usage rate. The Annex II reports an analysis from ACCIONA on the main types and size of gensets in construction work.

Local norms regarding the setup and operations of gensets differ not only from country to country, but from region to region. Permitting procedures need to start the earlier the better to guarantee an efficient planning process and roll out of test sites. Permitting needs to take into account local site-specific rules & laws (urban environment, green site, brown site, natural park

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etc) and they are generally divided in electrical – safety regulation and environmental – fuel leakage, emissions, sound levels etc.
Permitting process will need to be planned in close cooperation with responsible on-site energy provider and/or festival producer.

3.1 Current Business model for Temporary events/Music Festivals

A brief introduction to the steps necessary for the organization of a public event, such as those that will be presented in Italy.
The following requests are transmitted to the Municipality of Turin (http://www.comune.torino.it/torinogiovani/vivere-a-torino/i-passi-necessari):

- *Request authorization for temporary shows*. The case in which it is planned to carry out a temporary event of a show and / or public entertainment, and this event must take place in indoor facilities or outdoor locations that do not already have the necessary qualifications and authorizations for the performance of shows o permanent retreats, it is necessary to present an authorization request for temporary shows, regardless of whether the event takes place outdoors, on public or private grounds, or in indoor premises. In particular, the license for temporary performances must be requested when the event foresees the performance of artists in front of an audience, stationary or transit, and when the use of systems for the sound diffusion or the lights and / or the 'use of facilities such as stage, platforms, barriers or seats. It is not necessary to present an authorization request when the artists' exhibition does not provide for the use of electrical systems, stages and / or containment structures, but only the aid of acoustic instruments, for example in the case of street performers, bands etc.
  When the show provides for the use of containment facilities for an audience of more than 200 people, it is mandatory to present, at the same time the request for authorization for temporary shows, the request for the technical opinion of the Provincial Supervision Commission, at the Prefecture, for the viability of the facilities and facilities used.
  The two acts, a public show / detention license and the opinion expressed by the Provincial Supervisory Commission, are the authorizing elements that attest to the regularity of the event, in the absence of one of the two acts the event is not authorized.
- *Temporary occupation of public land* (the application must be submitted at least 20 days before the event) in case of outdoor events that take place on public land.
- *Authorization for the Environmental Technical Fulfillment Service*, in the case of events that take place outdoors and where the use of amplification and musical diffusion systems is planned on public land. The Municipality may authorize activities, shows and temporary events in a public place or open to the public, as required by the special Municipal Regulations on the protection of noise pollution in force since 19 June 2006, in derogation of the limits in the field of noise pollution, pursuant to Law 447/95, art. 6 and of L.R. 52/00, art. 9, possibly using the technical support of the ARPA of Turin.
- *License for the supply of food and drink, through a SCIA (Certified Report of Start Activities)*. The temporary exercise of the administration of food and beverages is strictly limited to the period and to the premises or places where the event to which it relates refers and is subject to the rules, regulations and authorizations relating to building, urban planning, with the exclusion of the relative ones. the intended use of the premises, and sanitary, as well as those relating to fire prevention, safety, and

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surveillance of the premises. From the point of view of health and hygiene, the EC Regulation 852/2004 defined in Annex 2 the general hygiene requirements applicable to all operators in the food sector, providing for a specific chapter, III, referring to the mobile and / or temporary. These activities are regulated, although not in contrast with the principles introduced by the Unified Conference on 4/5 and 6/7/2017, by the DGR n. 27-3145 of 19/12/2011, from DD n. 218 of 28/3/2012 and the DGR 19-7530 of 09/14/2018.

3.2 Analysis of technologies used

The electricity supply to the temporary event can be provided:

- Via Direct connection to the electrical grid
- Via gensets, each generator normally serves autonomous islands
- via a mixture of the two options

In temporary events, generators with different powers are normally used, starting from small for a few tens of kW up to 500 kW, according to the various electric utilities to be served. Below an example of generators in KappaFuturFestival:

- main stage generators (500kW)
- generators for gates and registers (32 kW)
- bar+ordinary lights and emergency+ bar supply+container power supplies (115 kW)
- ordinary lights+emergency gazebo food+emergency gazebo bar+ fridge + ice tray + staplers (115 kW)

for a total power of around 3 MW. In this kind of event redundancy is made on the stages, but in the block of services not.
The light towers installed are around 2 kW.

Figure 1. Gensets installation during the KappaFuturFestival (Turin_Parco Dora 6-7 July 2018).

For the treatment of fuel systems for powering the generators it is necessary to refer to the Circular MI.SA. n. 31 of 31 August 1978, which defines the specific installation equipment and rules according to the type of fuel used by the generating set, dividing the installations into two categories:

- generators powered by liquid fuel (diesel or fuel oil);
- gensets powered by gas (methane or LPG).

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The diesel engine is very reliable and can work without problems for several hours, so this kind of generators is used during events, moreover even if it is flammable, it does not explode: this allows you to store it without fear in tanks to have the stock when the generator's tank empties.

Here below some example of diesel gensets and their technical characteristics:

- 500 KVA - CAT XQP500 (Figure 2), weight 6879 kg, diesel tank 965 l, frequency 50/60 Hz;
- 33 KVA – CAT, power 26.4 kW, weight 900 kg, width 0.9 mt, Length 1.9 mt, height 1.5 mt, diesel tank 110 l, consumption 5.4 l/h
- 150 KVA - CAT XQP150, power 120 kW, weight 95615 kg, width 3.52 mt, Length 2.226 mt, height 1.120 mt, diesel tank 590 l, frequency 50/60 Hz;

Figure 2. Genset 500 KVA - CAT XQP500 from CGT

3.3 Permitting and authorization processes

Usually the electric designer is part of the event organizer's technical office and he takes care to respect local technical normative for installation and operation of the gensets, in agreement with the supplier (rental) of the generators.
Safety aspects 81/08; INAIL ex ISPESL on pressurized machines.
The temporary power installations are subject to different restrictions according to Italian law. The main fields regulated are their acoustic emissions, as well as fire hazard and electrical safety.

- Acoustic emissions: Italian “Direttiva 2000/14/CE” states that for power generation system from 10 to 400kW the maximum acoustic emissions have to remain below $E<95+lg(Pel)$ where Pel is the net power (expressed in kW).
- Safety Distance: If the genset is located open air, the minimum distance “D.M. 30/11/1983” dictates is 3,50m from every vertical structure.
- Fire hazard: “D.Lgs 152/06” states that there is no need for authorization but just the necessity to notify the following generator types:
    - Fuelling: LPG or Methane, Nominal power < 3 MW
    - Fuelling: diesel or petrol or biomass, Nominal power < 1MW
    - generators for the production of electricity in emergency service

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So, for the use of generators during temporary events no permits are required but an electrical project is presented; the project contains electric schemes and the details of the generators (power, quantity, fuel ...) and discussed with the supplier of the generators.
After that, the final project is presented to "Provincial Supervisory Commission" (Commissione Provinciale di Vigilanza) that must approve it.
Normally the Provincial Supervisory Commission check the project with an inspection, in the presence of the organizer and the generator supplier.
The project is presented about two months before the event and is discussed once a week until it is accepted.
If the generating set is designed to operate in parallel with the public grid, the technical rules established by the distributor must be applied. Usually the distribution companies provide a regulation for the operation with all the indications regarding the characteristics required, the calibration of the protections and the obligations of the customer towards the distributor and vice versa. After having carried out the necessary checks, the customer will be sent a certificate to the distributor with the calibration values of the protection devices, an attestation of the correct operation of the system and the list of the persons authorized to carry out the management on the 'facility.
From the grid point of view, normally the power supplier takes care of all special permits that a "heavy temporary" connection to the local grid can require due to local grid instability.

The installation's project of an outdoor genset does not present particular technical problems. The precautions to consider in this installation are to provide:

- compliance with the requirements set out in the MI.SA circular. 31/78;
- a concrete foundation for positioning the generating set so that it can work on a planar surface, in the absence of water stagnation and vegetation disturbances;
- a protective roof to prevent rain water from wetting electrical equipment. Its dimensions in plan must be clearly superior to those of the generating set;
- the exhaust gas pipes at a height that does not create problems for people;
- protections on potentially dangerous parts: for moving parts, for hot parts of the engine and for direct contacts with electrical equipment.

3.4 Rental and procurement, contractual aspects and fuel supply

Specific rental agreements are stipulated between the Event Organizer and the genset supplier. This rental agreement offers some kind of benefits: simplified order processes, priority in the allocation, customized fees and payment terms, update of the fleets with new machines.
Normally, the genset supplier offer consultancies with also support in the electric project.
The machine can be rented also for one day and the contract includes:

- Transport A/R
- Installation
- Testing
- Maintenance and repair assistance
- Machine substitution if needed
- "all risk" insurance
- Disassembly

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4. Permissions, Regulations and Requirements comply with hydrogen generators

4.1 Inputs from HyLAW project

The main inputs related to regulations, permittings/requirements and authorization needed come from the HyLAW project[22] (Identification of legal rules and administrative processes applicable to Fuel Cell and Hydrogen technologies' deployment, identification of legal barriers and advocacy towards their removal).
The project brings together 23 partners from Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Hungary, Italy, Latvia, Norway, Poland, Romania, Spain, Sweden, Portugal, the Netherlands and United Kingdom and is coordinated by Hydrogen Europe.

The focus of the section is to put in evidence the main aspects related to the H2 gensets permission's procedures and a comparison to the main EU countries mainly involved in the demonstration of the availability and performance of the gensets. It is necessary underline that HyLAW did not analyze the regulation for temporary events, but some analysis inside of it are useful for the project.
A summary from HyLAW will be reported first of all:

- Transport of H2 in cylinders and tube trailers
- Stationary storage

[22] https://www.hylaw.eu/database

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4.1.1 Transport of H2 cylinders and gas trailers/permitting/certification and requirements

Below a comparison between countries.

country	certification for a driver/trasnporting company	authority deliver certification	equipment's requirements	specific approval	Quantity and pressure requirements and limitation
IT	The regulation ADR 2017, as transposed by Decree of Ministry of Infrastructure and Transport, 12 May 2017, in Part 1 'General provisions' of the Annex A contains provisions concerning the respective safety obligations and certification of the various participants in dangerous goods transportation chain and regarding Safety Advisers who are responsible to monitor, control and identify ways in which the work associated with the transport of dangerous goods is carried out as safely as possible. The vehicle driver must have an ADR certificate.	National requirements for appointment, tasks, training, examination and certification of dangerous goods Safety Advisers (DGSA) are set out by Ministry of Infrastructure and Transport (art.11, Legislative decree n.35, 27 January 2010).	The Annex B of the ADR 2017 makes provisions concerning transport equipment and transport operations. In particular is divided in Part 8 Requirements for vehicle crews, equipment, operation and documentation and Part 9 Requirements concerning the construction and approval of vehicles.	The equipment shall comply with the requirements of ADR European Agreement for tanks and vehicles and also with the requirements of Transportable Pressure Equipment Directive.(ADR tank approval, ADR vehicle approval)	Pressure_The reference rule is the international standard ISO/TS 16111:2006, which defines the requirements applicable to the safe design and use of transportable hydrogen gas storage canisters, including all necessary shut–off valve, pressure–relief devices (PRD), and appurtenances, intended for use with reversible metal hydride hydrogen storage systems. ISO/TS 16111:2006 only applies to refillable storage canisters where hydrogen is the only transferred media. Storage canisters intended to be used as fixed fuel storage on board hydrogen fuelled vehicles are excluded. No limitation on quantity
ES	The vehicle drivers have to be licensed for transport of dangerous goods.	The Dirección General de Tráfico ("DGT"), which is the organism in charge of the control of the traffic in Spain.	They are specific rules detailed in the ADR. There is more detailed information about the bulb in the Royal Decree 97/2014, with a specific annex (V) which gives national regulations regarding the transport of dangerous goods.	ADR approvals.	Pressure_The dangerous transport of goods authorization. The Dirección General de Tráfico ("DGT"), which is the organism in charge of the control of the traffic in Spain.
FIN	he driver has to have a valid certificate for transporting dangerous goods. The certificate has to be renewed every five years.	Independent bodies approved by Finnish Transport Safety Agency (Trafi)	European ADR regulation describe these. The vehicle has to be classified for transportation of flammable gasses (FL).	Nothing hydrogen–specific nationally. Transport and gas cylinders have to follow the European regulation. So far (2017) there is no liquid hydrogen transported on Finnish roads	Pressure_To date (2017) the hydrogen bottles are delivered at 200 and 300 bar pressures. If only the gas cylinder is certified, there is no additional pressure limitation of transport on roads. Quantity_1) Up to the "free limit" of 333 litres of hydrogen there are no route restrictions. The driver has to be sufficiently trained (meaning aware s/he is transporting flammable gas), there has to be at least a 2 kg fire extinguisher and there has to be an appropriate marking in the cargo book. 2) Transportation of amounts over 333 litres of hydrogen is regulated more strictly. 2.1) In the unlikely event that vehicle is not classified as a container vehicle, it does not have to be ADR classified as FL (flammable gas) and it does not have route restrictions. This is the case if there are separate hydrogen bottles not connected to each other. Still all the other ADR restrictions are valid: the driver has to ADR qualified, the driver and vehicle need to have proper equipment, no passangers etc. 2.2) If the vehicle is classified as container vehicle, the vehicle has to be ADR classified as FL (flammable gas) and does have ADR route restrictions. The usual way of transporting hydrogen is in MEG containers in which individual bottles are interconnected with pipes. This is interpreted as container in vehicle context. 3) In the ADR regulation the overall maximum weight is defined for the vehicles. Since hydrogen is the lightest element in the universe, it hardly limits the mass, rather the weight of the bottles.

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country	certification for a driver/trasnporting company	authority deliver certification	equipment's requirements	specific approval	Quantity and pressure requirements and limitation
DE	Companies involved in the transport of dangerous goods have to appoint a dangerous goods officer The dangerous goods officer must purchase an ADR training certificate (ADR–Card) which is issued for a limited period (for five years) after successful completion of a course. For the transport of dangerous goods on the road, the driver must purchase an ADR training certificate for the specific hazardous cargo which is issued for a limited period (for five years) after successful completion of a course. The driver must carry his ADR certificate, photo-identification, instructions in writing and ADR transport document in the vehicle. The transporting companies have to ensure that the vehicles display orange plates as well as the vehicles and the cargo are marked and labelled for transport of hydrogen. There are uniform standards at national level for the certificate examinations.	Industrial and Commercial Chambers (IHK) for their respective districts.	The equipment shall comply with the requirements of ADR European Agreement for tanks and vehicles (ADR tank approval, ADR vehicle approval) and also with the requirements of Transportable Pressure Equipment Directive (CE – Certification and Marking, Pi Marking) for pressure receptacles (cylinders, tubes) and tanks	ADR tank approval, ADR vehicle approval -– for carriage of hydrogen in tanks with a capacity exceeding 1 m3, CE - Certification and approval for pressure receptacles and tanks according to the Transportable Pressure Equipment Directive	ADR does not restrict pressure limits for hydrogen transport, but the pressure receptacle should have a safety factor 3. The safety factor is defined as the ratio between the burst pressure and the nominal fill pressure. The limitation of hydrogen quantties to be transported are assosiated with the volume limitations of the cylinders and tubes used and the maximum allowed weight of the transport vehicle (up to 40t in Germany).According to the UN Model regulations on the transport of dangerous goods, ADR European Agreement and the Transportable Pressure Equipment Directive the cylinder/tube volumes for transport of compressed gases are restricted (450l for cylinders and 3.000l for tubes. A new ISO standard ISO/DIS 17519:2017(E) "Gas cylinders — Refillable permanently mounted composite tubes for transportation" is currently under development giving the following limitations: Tubes covered by the requirements of this standard are: a) of composite construction, permanently mounted in a transport frame and suitable for specified service conditions, designated as: 1) Type 3 – a fully wrapped tube with a seamless metallic liner and composite reinforcement on both the cylindrical part and the dome ends; or 2) Type 4 – a fully wrapped tube with a non–load sharing liner and composite reinforcement on both the cylindrical part and the dome ends. b) with water capacities from 450 l up to 10.000 l; c) with working pressure up to 1000 bar This standard does not address tubes with working pressure times water capacity (p x V) more than 3 000 000 (MPa – L). This draft standard shows new future limits.
NL	Drivers license for carrying compressed gasses and liquid gasses, CCVB certificate for fulfilling the job.	RDW Government road department.	2 year check of equipment, the equipment has to match ADR and the UN 1049 compressed H2 and 1966 for liquid H2 H2 material info of RIVM	Approval according to TPED	Pressure_The classic industrial transport of hydrogen is at 200 bar pressure and up to 300–400 kg per truck in steel tubes. The more innovative transport of hydrogen for transport applications can be done at 500 bar up to 1100 kg per truck in carbon tubes. The weight maximum is at 44 ton truck weight overall. The ADR does not explicitly state a certain maximum pressure or temperature for the technical unit but a reference to standards. After inquiring a supplier of hydrogen cylinders, it is indicated that the working pressure is an important factor. The operating pressure is the pressure of a compressed gas at a reference temperature of 15 °C in a full gas cylinder. ISO 11119-3 indicates the conditions under which the cylinder can be designed with which operating pressure. The standard therefore indicates the design conditions. It has been indicated that 300 bar is an economically interesting workload for the design and that this 300 bar is therefore regularly used as a working pressure. No quantity limitations but limitations on how much can you carry given the size and weight limits of the truck
B	ADR certification (valid for five years). This can be extended when a specific training is done (35h course) – Code 95 regulation). The ADR imposes rules for the security of the transport, imposes to have a safety officer for the transport of dangerous goods.	Accredited centres can organise the training; the certification is delivered by the cell ADR, part of the Department Mobility and Public Works"	ADR certification of the vehicle (valid for one year) ● Periodic technical controls every 6 months in Flanders and Brussels, once a year in Wallonia. ● Periodic ADR controls, once a year. Both are done by a NOBO; accredited centres for vehicle inspection)	ADR tank approval, ADR vehicle approval .For a tank car transporting gases an endurance braking system and a test certificate is required (for all gases, not specifically for hydrogen).	There is no limitation. Gas cylinders have standard pressures of 200 bar and 300 bar. There is no limitation, as long as the containers are designed for the maximum pressure that can occur during transport.

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4.1.2 Stationary storage/permitting/certification and requirements

The evaluation of hydrogen storage must be subject to some evaluations:

- Risk Assessments (as operationalized from the general obligations laid down in the SEVESO Directive).
- Health and Safety requirements and conformity assessment procedures, as envisioned by the ATEX Directive.
- Environmental Impact Assessment procedures, as envisioned by the SEA and EIA Directives.

and is and is governed by the following EU directives::

- Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (so-called SEVESO Directive)
- ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres
- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment).
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (EIA Directive)
- Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive)
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.
- Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment.

HyLAW project reports detailed information mainly linked with the HRS installations, divided for each Member State, on permits, steps to follow in order to obtain them, authorities to turn to and an indication of timing to have permits.

4.2 Permissions and standards to be taken into account for what it concerns installation of gensets

Temporary gensets installation and use in dedicated sites (both construction sites and temporary sites) often have to be compliant to special sites regulatory framework particularly related to permitting and safety to workers aspects. Here in the following some of the most important directive/guidelines that the installation/use of gensets in dedicated sites have to be compliant to are presented (D1.1 – Test Site Description and requirements for EVERYWH2ERE gensets specification).

EVERYWH2ERE gensets have to be compliant to this directive and to be equipped with all the required components. The chapters below report guidelines useful for the definition of requirements for the use/installation/operation of the gensets.

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4.2.1 Health and safety of workers

Health and safety aspects, related to workers, was taken into account by the European Commission in the Framework Directive 89/391/EEC. In addition to the Framework Directive, a series of individual directives and regulations focusing on specific aspects of safety and health at work were adopted.

Mainly, Directive and Regulations that have to be considered are:

- Directive 89/654/EEC - workplace requirements,
- Directive 89/655/EEC – work equipment,
- Directive 89/656/EEC - use of personal protective equipment,
- Directive 90/269/EEC - manual handling of loads,
- Directive 92/58/EEC - safety and/or health signs,
- Directive 95/16/EC – lifts,
- Directive 2001/45/EC - use of work equipment for working at height activities,
- Directive 2006/95/EC - electrical equipment,
- Directive 2006/42/EC - new machinery directive,
- Regulation (EC) No. 1907/2006 - REACH concerning registration, evaluation, authorisation and restriction of chemicals and establishing a European Chemicals Agency,
- Regulation (EC) No. 1272/2008 (supplementing of Regulation (EC) No. 1907/2006 – REACH),
- Directive 2009/104/EC – use of work equipment,
- Regulation (EU) 2016/425 on personal protective equipment.

These Directives and Regulations are implemented differently in the legislation of each Member State and sometimes Member States legislation can be more restrictive.

4.2.2 Access requirements

The Directive 89/654/EEC concerns the minimum safety and health requirements for the workplace. The Directive gives general information about how to manage with work places to enhance safety. Each Member State than has provided, in its own legislation, the implementation of the minimum requirements.
Related to access requirements we first need to assess:

- Possibility of moving safely about the workplace,
- Possibility of escaping from the workplace in case of fire or other emergency from the site to a safe area,
- Possibility of having safe access to any place or workplace amenity.

Additional information on D1.1.

4.2.3 Man/machine interface

Man/machine interface is a key issue on sites. The main hazards associated with man/machine interface are:

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- Personnel being struck by plant and vehicles,
- Personnel being crushed by plant and vehicles,
- Collision between plant and vehicles.

Additional information on D1.1.

4.2.4 Health and Safety Signs (Site Hazards, Emergency, Specific behaviour, etc.)

Safety signs are to be displayed where the risks to health and safety cannot be avoided by other means. Safety signs are to be pictorial wherever possible and where lettering is used it must be in English and the native language of the workers on site.
The colours and shapes of safety signs are to be compliant with *Directive 92/58/EEC - safety and/or health signs* and/or with national legislation (if in place).

Safety signs are to be regularly cleaned and inspected to ensure they have not faded, been damaged or have been removed.

4.2.5 Emergency preparedness

Emergency response should focus on the prevention of ill health and injury, and on the minimization of the adverse safety consequences to persons/workers exposed to an emergency situation. A plan for responding to emergency situations should be developed and should also take into account applicable legal and other requirements. The emergency procedures should be:

- Clear and concise to facilitate their use in emergency situations,
- Readily available for use by emergency services.

Emergency response procedures should define the roles, responsibilities and authorities of those with emergency response duties, especially those with an assigned duty to provide an immediate response. These personnel should be involved in the development of the emergency procedures to ensure they are fully aware of the type and scope of emergencies that they can be expected to handle, as well as the arrangements needed for coordination. Emergency service personnel should be provided with the information required to facilitate their involvement in response activities. Emergency response personnel has to be properly trained and should remain competent and capable to carry out their assigned activities. The need for retraining or other communications should be determined when modifications with an impact on the emergency response occur. Periodic testing of emergency procedures should be performed to ensure that the organization and external emergency services can appropriately respond to emergency situations and prevent or mitigate associated safety consequences.
Emergency drills can be used to evaluate the organization's emergency procedures, equipment and training, as well as increase overall awareness of emergency response protocols. Internal parties (e.g. workers) and external parties (e.g. fire department personnel) can be included in the drills to increase awareness and understanding of emergency response procedures.

Additional information on D1.1.

According to these issues, genset installation should be submitted for the approval of local Fire Department.

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4.2.6 Health & Safety Plans and Risk Assessment

The Health and Safety Plan is the document where has to be defined, for a specific worksite, the foresee activities, the related risks and the measures that are going to be implemented for eliminate/reduce them. The Health and Safety Plan has to cover all the relevant activities focus on the management of health and safety on site including, as a minimum, the following data:

- Project Scope of Work and Key Employees,
- List of major activities (specify planned duration) and perceived major hazards,
- Regulation and Permits H&S requirements
- Fire Fighting Requirements
- Description of main activities,
- Location of activity site(s),
- Number of employees (estimated) and main professional tasks,
- Organization structure chart,
- Chief Project Foreman and lead Health and Safety managers,
- Qualified person(s) to provide first aid, fire-fighting and evacuation on site,
- Emergency reaction system and activation, specifying teams and team leaders,
- Description of the risks affecting the activities (risks assessment),
- Description of the measures adopted to eliminate/reduce risks.

The Health and Safety Plan has to be reviewed and up-dated to reflect changes to work practices, to work activities and to site conditions.
The risk assessment has to:

- Establish the risks arising from the work activity,
- Be appropriate, given the nature of the work, and such that it remains valid for a reasonable period of time,
- Be proportionate to the level of risk and the nature of the work,
- Identify and prioritise the control measures required to protect the health and safety of the employees and others who may be affected,
- Take account of any factors that could change during the course of the job, thereby introducing additional hazards or increasing the level of risk arising from existing hazards.

Risk assessments must be undertaken by competent persons who have knowledge and experience of the activity being assessed and the process must start at the design stage and continue through the construction stage. Documentation arising from the risks assessment shall contain the proposed resolution or mitigation measures necessary to reduce these risks.
Risks assessment has to be reviewed as the Health and Safety Plan to reflect changes to work practices, to work activities and to site conditions. It has also been reviewed when there have been changes in legislation or other guidance relevant for the project.

4.2.7 Other Standards And Best Practices

In addiction to the Regulation Requirements the following list of standard and best practices should be take in account for the evaluation planning and implementation of the topics above mentioned:

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- NFPA (National Fire Protection Ass.) 50A: Storage of Hydrogen,
- NFPA (National Fire Protection Ass.) 50B: Storage of Liquid Hydrogen,
- US OSHA 29 CFR Pt. 1910: Occupational safety and health standards.

4.2.8 Fire departments involvement

As reported in the section 6.2.5, genset installation should be submitted for the approval of local Fire Department.
Fire Departments are the Regulation/permitting actors that allow gensets installation both for events and constructions sites and they are specifically the authority that is always asked for a consulting when we talk about hydrogen appliances and safety (considering that no common hydrogen regulation exists).

LINDE is in strict contact with Italian National Fire Department committees and EVERYWH2ERE promote an interaction between National Fire Department on these topics under FCH JU/Hydrogen Europe supervision.

A specific regulation in Italy, to take in consideration **is the DECREE OF THE PRESIDENT OF THE REPUBLIC, August 1, 2011, n. 151 simplify the discipline of fire prevention proceedings, a pursuant to article 49, paragraph 4 -quater, of the decree-law May 31, 2010, n. 78, converted, with modifications, by the law 30 July 2010, n. 122.**
This regulation identifies the activities subject to fire prevention and discipline controls, for the deposit of projects, for the examination of projects, for visits techniques, for the approval of exemptions to specifications regulations, the verification of fire safety conditions which, according to current legislation, are attributed to the competence of the National Fire Department.
The regulation reports that a storage of flammable gases below 0.75 m3 (geometric quantity) is not subject to fire fighters controls.
Everywh2ere project will use H2 BB volume 200L, with a geometric quantity respectively of 0,66 m3 and 1,98 m3 for 25 kW (3 tanks) and 100 kW (9 tanks).
With this approach, staying below 0.75 m3 (geometric quantity) could only avoid the need to consult the FF beforehand in order to have formal confirmation that the fire protection project signed by a professional is not required. In terms of operations and plant, it does not simplify the activities because the risk introduced will have to be evaluated and included in the safety or emergency plans.

Based on LINDE considerations, for “temporary storage” it is normally not necessary to follow the process foreseen by Presidential Decree 151/2011 which envisages a fire-prevention project signed by a professional, waiting for 30 or 60 days for acknowledgment or tacit consent.
The various provincial commands, given the short "life" of the deposit of inflammable material, only suggest to define areas of risk related to possible spills and therefore formation of explosive atmospheres.
For each individual installation based on a risk assessment, it will be necessary to identify and delimit these areas to avoid proximity to sources of ignition. If replicable, the same assessment could also become a standard.

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In the case of events open to an audience, the content of the risk assessment (specific or standard) must then become part of the general event emergency plans. Surely, you will have to inform the organizer of the event as well as the bodies or personnel responsible for managing emergencies.
In the case of a construction site in a similar way the content of the risk assessment must become part of a “Security and coordination plan”. In Italy it is the document that the coordinator for the design or execution of the work, on behalf of the client, must draw up before work is started on a construction site

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5. Non-technological barriers

Generators can be rented easily and cheaply from a very big amount of rental companies all over Europe. Nevertheless, there are some rental companies, energy providing companies and service providers, with a strong background in the festival sector. With some of these a strategic partnership could make sense to ensure access, setup and operation of the festival test sites.

As of today hydrogen and FC gensets are more expensive for festival promoters to rent & run due to the fact that diesel gensets are really cheap to rent basically everywhere in Europe. This does not even take into account the price and limited disposability of hydrogen. Within the existing market situation / pricing of diesel gensets the switch to hydrogen and FC gensets seems is not feasible from a business point of view. This would change in case of a clear regulatory framework regarding CO2 emissions of events or a subsidized market change. Furthermore, the use of not yet certified equipment could be a potential non-technological barrier in the use of EVERYWH2ERE gensets as well as in their transport according to International Carriage of Dangerous Goods by Road (ADR) also considering that music festivals are often scheduled in weekend when certain goods like hydrogen cannot be transported on highways etc.

Main barriers:

- Costs of the technology and fuel
- Logistic aspects related to easiness of refueling/easiness to find hydrogen supply point close to cities
- People sensitivity to H2 technology (no safety problems)
- Lack on homogenous regulations on H2 technologies, installation and storage or specific involvement of fire fighters. If we look on HyLAW project there are regulatory gap in different EU countries and in any case the processes to obtain authorization and permits are so long to include create difficulty in the technology penetration on the market. Processes to have permits are not uniform throughout the country, so the time to obtain the permits.

Talking about regulation it's quite important to state that currently EU does not currently regulate emissions from stationary diesel gensets in the power size of EVERYWH2ERE generator (NNRM directive – Stage V - 2016 can be applied only to above 560 kW gensets[23]) thus not promoting the effective promotion of low size gensets that are often used by private owners (like booth owners in fairs and temporary events) or by events/application that do not require big power.

Promoting more sustainable events is becoming more and more common in EU[24]. For example, as understood by EVERYWHERE consortium during 30-31st August C/O POP Convention in Cologne, several EU Festivals are promoting their "Impact 0" brand/image, mostly promoting use of RES based energy, promoting carpooling among attendees, CO_2 compensation trees

[23] https://www.dieselnet.com/standards/eu/nonroad.php

[24]http://ec.europa.eu/environment/emas/pdf/other/EC%20Guide%20Sustainable%20Meetings%20and%20Events.pdf

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planting, reduction of wastes promoting the use of recyclable/bio-degradable materials etc. but even the current normative ISO 20121[25] about Event Sustainability Management System doesn't take care into relevant consideration to promote low impact of temporary power supply.

Promotion of low emission gensets in construction sites is now encouraged by some EU cities and regional authority (Israel and the Netherlands above all) who are now promoting the introduction of low carbon construction power supply into public tendering as one of the decision making/ranking voices.

The same can be stated for gensets used for prime, peak shaving, load shedding or emergency standby power (so for grid services[26]) where US are a little bit more advanced on this[27].
Another regulatory barrier to an homogenous and comprehensive promotion of EVERYWH2ERE Gensets in Europe is the fact that for what it concerns installation and handling of low voltage generators a comprehensive EU standard doesn't exist, but there are best practices and standards from National Electric Committees that more or less receive in similar ways the Electric Equipment Directive (EED) supervised by CENELEC.

Nevertheless, as explicitly stated by city and industry representative during "EVERYWH2ERE City Stakeholders' Group Launching Event", held in Brussels on 15th January, it is not only a matter of regulation and policies.

Even if authorities and committees can promote hydrogen gensets via dedicated policies and incentivizing regulatory framework, the main challenge for hydrogen as widely accepted fuel for temporary power gensets (particularly if compared with diesel) are:

- The logistic easiness of the hydrogen supply (where to find hydrogen, at which cost, easiness of refilling hydrogen tanks etc.)
- The guarantee of a "green hydrogen" origin: this is a request that most of our potential demosites already required us. Environmental friendly oriented end-users are indeed keen to have a solution that guarantee a 0-emission generation not only at local level, but at globally speaking.

These are the main challenges for a rapid market uptake our and other hydrogen implementation project outcomes/products: guarantee an easy-to-be-supplied and low cost green hydrogen in EU cities.

[25] http://www.iso20121.org/
[26] https://www.amps.org.uk/sites/default/files/uploads/AMPS_Power_2013_Issue1.pdf,
[27] https://www.cpower.com/PDF/InfoSheets/27.pdf

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6. Identification and engagement of the stakeholders

The D7.3 – "Dissemination & Communication Plan" reports a list of stakeholders or interest groups that are, from a broad perspective, any group or individual that may affect or be affected by the achievement of the project's objectives.
In the first months of the project the consortium has been in contact with several institutions, starting from institutions who signed during the proposal phase. Interaction with potential supporting partners were performed both at local level (FHA and ENVI in Aragon and Piedmont region; GENPORT with CGT as the main diesel gensets rental company in Italy and FHA with Aggreko and Atlas Copco) and at EU level (D1 and RINA-C launched the project in Music Festival oriented event in Cologne on 30/31 August in Cologne C/O POP Convention).

However, ICLEI Europe, in cooperation with the EVERYWH2ERE project, organised the 15th January 2019 a city-oriented workshop on "Upscaling Hydrogen Genets in European Cities". The event highlighted modern Fuel Cell and Hydrogen (FCH) technologies as clean alternatives to fossil fuel generators in providing energy for construction sites, festivals and other temporary urban events.
The H2Corner, which will be setup in the exhibition area during the genset "hosting events", will present in a didactic and simple way the project objectives and the potential of FCH technologies. The H2Corner will be set up by the local project partner, based on a tool kit developed by D1Furthermore the installation of the gensets in construction sites will be promoted at local level and the sites will be open for visits.

Starting from the list specific categories of them can be engaged in order to implement knowledge of the project, advantages and involve them during the demonstration campaign.
Below the main stakeholders groups that can be engaged along the project during all the demonstration activities with specific agreements/commitments, each of them with specific activities and involvement.

So far EVERYWH2ERE consortium has received the following Letter of Engagement to the Stakeholders' Group:

- Hydrogen Europe - Belgium
- CGT Italia SpA - Italy
- Intelligent Energy Ltd – UK
- GreenFilm Association - Germany

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Target audience	objectives	HOW ENGAGEMENT
Event organizers	inform&involve in demo phase with specific agreement/committmnets	Demonstration events Sending materials for your exhibition Actions with media and interest groups H2CORNER Launching event in Cologne for the Music Festivals
Gensets Companies	inform&involve in demo phase with specific agreement/committmnets new business opportunities	Demonstration events Sending materials for your exhibition Actions with media and interest groups H2CORNER Launching event in Cologne for the Music Festivals
DSO Companies/Energy Utilities	inform&involve in demo phase with specific agreement/committmnets new business opportunity	Demonstration events Sending materials for your exhibition Actions with media and interest groups H2CORNER Launching event in Cologne for the Music Festivals
Cities	inform&involve in demo phase	General information Demonstration events H2CORNER Launching event in in Brussels for Cities
FCH players	inform&propose new business activities	Demonstration events Sending materials for your exhibition Actions with media and interest groups H2CORNER Hannover Messe
Clusters and sectoral organizations related to hydrogen	inform	General information Meetings with associations and other representative projects

Table 5. Stakeholders groups to involve along the project

1. *Event Organizers stakeholders' group*

The involvement/engagement of Event Organizers is crucial in order to formalize the demo-phase.

The group was just involved during the submission project phase with signed LoS and now it is continuously involved and the list of Events continuously implemented.

The direct involvement of Event Organizers goes through a decision tree (D1.5 Temporary Events and Music Festivals demonstration calendar) which ends positively with the event selected and the Organizer's engagement. The selection passes through the compilation of a "basic data collecting" survey, aiming at gathering information about the event (step 3), if event fulfills criteria to be selected as demosite, the Partner presents it to the rest of the Consortium (step 6) and in final the event promoter signs a Letter of Commitment (LoC) (step 8).

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The Annex III reports information on new stakeholder, Green Film Shooting 2018.

2. *Genset Companies stakeholders' group*

The involvement of rental gensets companies is crucial in order to implement events during all the demonstration phase but could also introduce them in a new sector as fuel cell market is.
This involvement could help the partners to develop a suitable contractual arrangement and business model for future gensets exploitation.
The Companies will be involved in all the demonstration phases and mainly during the results phase, it could help them in evaluating the fuel cell market and to include Fuel cell gensets in their market.
The table 1 reports current Companies and technologies used for providing traditional power/renting gensets already contacted or to be contacted during the project.
The final objective of the involvement of gensets companies is to propose new business opportunities, giving them the tools for a business transformation. As reported for Bredenoord, it is a rental/sale traditional gensets but just in new market oriented. It proposes two hydrogen prototypes 5 kVA and 17,5 kVA.

3. *DSOs Companies/Energy Utilities stakeholders' group*

The direct involvement in the project of IREN ENERGIA and IREN SpA (ENVI linked third party), which are DSOs and important energy utilities in Italy providing tailored solutions in different events confirm the importance of having on board final end users. During all the project these stakeholders will be contacte.
Among the energy services provided, Energy Utilities give also support in exhibitions and events where it is needed a temporary rental power, cooling and heating solution, with:

- The selection of the appropriate solution (diesel generator, medium voltage generator, ecc…) in terms of power output capacity, fuel consumption, soundproofing level, ease of maintenance and environmental concerns;
- The design of the temporary plant considering the integration with the already installed power systems / in parallel to the grid connection, or the design of a stand alone power generator;
- The installation of the generators and the operation service (ordinary and emergency maintenance)
- The evaluation of level of noise, emergency plan and fuel management.

The final objective of the involvement of DSOs is to propose new business opportunities, giving them the tools for a business transformation.

4. *City stakeholders' group*

Considering the city as a living laboratory where to test FC gensets and technology, allows also to disseminate project results and hydrogen technology to a very big audience, in order to increase public awareness about hydrogen and fuel cell technologies reliability and affordability.
The presence of ICLEI, the network of global local governments working for sustainability, will guarantee a strong interaction with EU local authorities which play a fundamental role for the promotion of these technologies through specific policy and regulatory schemes. The

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project results will be also promoted through webinars that will be addressed to both industrial and public stakeholders.

The "Upscaling hydrogen gensets in EU Cities" workshop took place back-to-back with the 9th General Assembly of the Regions & Cities initiative of the European Union's Fuel Cells and Hydrogen Join Undertaking (FCH JU).
With European cities driving the decarbonisation of transport, urban heating and cooling, industries and services forward, the workshop will focus on how FCH technologies as a 100% clean alternative to diesel-based generator equipment can support cities in reaching their climate and energy targets, reduce emissions and noise and increase air quality.
This workshop offered:

- an understanding of how hydrogen gensets can be a viable alternative to diesel generators
- a platform to exchange on the necessary regulatory frameworks for deploying temporary hydrogen gensets in city areas
- the opportunity to speak about and promote own innovative decarbonisation measures

The workshop served as an entry point for becoming part of the EVERYWH2ERE Cities Interest Group to explore options for hosting hydrogen generator sets and to profit from tools and long-term recommendations generated throughout the project.

5. *FCH players stakeholders' group*

FCH players thanks to the top-level EVERYWH2ERE partnership at EU level (LINDE, PCS, MAHY are FCH technologies provider for a lot of industrial players at EU level).
The main objective is to create a contact network presenting project results through webinars.

RENTAL COMPANY	market (EU, worldwide=ww)	URL	FC market
Intelligent Energy	UK	https://www.intelligent-energy.com/	Small scales PEMFC based equipment for events (lights, gensets, plugs etc.) max 5 kW
Areva	FR	http://www.arevah2gen.com/en/	Containerized PEMFC based gensets for back up power

Table 6. Rental gensets companies involved in H2 technologies

6. *Clusters and sectoral organizations related to hydrogen.*

Since EVERYWH2ERE is a project of the FCH2JU and also is aligned with the different existing national initiatives in Europe in relation to hydrogen mobility, working meetings will be organized with these entities and with relevant projects that are already underway in the EU as HyLaw and HySea.
The main objectives are to meet associations and so other representative projects, searching for collaborations.

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7. Preliminary identification of innovative contractual arrangements and marketing aspects

During demonstration engagement phase, three potential contracts have been studied and will be proposed to demonstration sites also to evaluate how project funding/gas supply dedicated budget can cover some costs of the hosting/demonstration

1. RENTAL GENSET CONTRACT: Everywh2ere Consortium will propose to demosite responsible an omni-comprehensive rental contract (transport + fuel, cost per day) whose value should be very similar to traditional diesel gensets value. In case of difference/remarks from demo owners, EVERYWH2ERE project can consider to cover the difference between traditional diesel genset rental contract and EVERYWH2ERE genset rental contract.
2. GAS SUPPLY COST COVERAGE: transport and installation costs should be up to the demosite responsible and EVERYWH2ERE: consortium should cover gas supply costs.
3. FULL DEMONSTRATION COST COVERAGE: the whole demonstration costs (transport, installation, gas) should be covered by the project

In the framework of WP6 activities, preliminary innovative contractual arrangements and marketing solutions in order to encourage the use of EVERYWH2ERE gensets have been studied foreseeing mostly highlighting the fact that:

- In case of use of green hydrogen and in case of will of the event to be “emission zero”, compare the cost of rental EVERYWH2ERE gensets with diesel gensets rental cost plus compensation measures costs
- Create joint venture between local hydrogen refueling stations or local hydrogen production point (particularly if producing green hydrogen) to promote a proximity business models that can facilitate logistics
- In case of possibility to have an ATEX Area in the site, promote storage of hydrogen via EVERYWH2ERE standardized bundles of bottles (3 bottles rack for 25 kW, 9 bottles rack for 100 kW) to reduce the costs of refueling
- In case of longer term of rental (at least month) consider the opportunity to locate/rent in the same place a small electrolyzer able to produce itself electricity exploiting local grid/power production

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8. Conclusion and Future Plans

In this report, an accurate view of the current gensets business model is reported, analyzing the commercial technologies used, the permitting and authorizations to use them and the current contractual agreements between genset rental companies and the final customer.

Generator sets are small but significant source of air pollution. Estimated inventory emissions vary largely across member states; generator sets could amount to up of 50% of total NRMM emissions of NOx, 20% of PM (with NRMM amounting to ~ 1/10 of total fuel use for road applications). Generator sets (emission inventory code: SNAP 080816).

One of the outcome of "EVERYWH2ERE City Stakeholders' Group Launching Event", held in Brussels on 15th January has been that some cities in EU are now promoting the introduction of low carbon construction power supply into public tendering as one of the decision making/ranking voices, thus promoting innovative gensets or energy grid connection where contracts guarantee Renewable origin of their electricity.

In the last years, pollutant and noise emissions reduction has become a priority for local authorities, not only for what it concerns "urban background noise" (traffic) but also for what it concerns "additional" emission and noise related to temporary events and construction sites. Environmental noise affects a large number of Europeans and the general audience perceives it as one of the major environmental problems Since environmental noise is persistent and inescapable, a significant proportion of the population is exposed to it (75% of EU citizens live in cities). The EU Green Paper Future Noise Policy states that around 20 % of the EU's population suffer from noise levels that health experts consider to be unacceptable, i.e. which can lead to annoyance, sleep disturbance and adverse health effects.

At the same time Regulation (EU) 2016/1628 of September 2016 on requirements relating to gaseous and particulate pollutant emission limits for internal combustion engines for non-road mobile machinery, sets up lower threshold for pollutant emissions that will oblige a turnover in the current temporary gensets fleet dominated by Diesel.

In this framework, FC Gensets can become a turnkey technology proposing a zero emission/zero noise reliable power supply to be used in in hostile environments such as construction sites potentially also bringing higher flexibility in their work scheduling (nigh-time) and to avoid bothering noise during music festivals and temporary events.

In this frame the stakeholders groups identified and continuously contacted/informed/involved play a crucial role.

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