APPRAISAL REPORT

FOR ABRUZZO AIRPORT PILOT ACTION

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CONTENT

I. EXECUTIVE SUMMARY 4
II. BACKGROUND OF THE PROJECT IMPLEMENTATION 5
III. Abruzzo AIRPORT NEEDS ANALYSIS SUMMARY 12
IV. DESCRIPTION OF PILOT ACTION IMPLEMENTED 13
V. ENVIROMENTAL ANALYSIS 14
VI. ANNEX I – TECHNICAL SPECIFICATIONS 22
VII. ANNEX II – PICTURES 26

I. EXECUTIVE SUMMARY

The main objective of ADRIGREEN project is to improve the integration of Croatian and Italian ports and airports with other modes of transportation to enhance the processing of passengers during the summer seasons and to improve environmental performances of the Adriatic maritime and aviation systems.

According to project life cycle progress, international investigation has been performed to identify best existing solutions for lowering airports and ports environmental impact. Further, these identified solutions have been summarized in Joint Action Plan definition for each region / partner.

Abruzzo Airport pilot action objective included adoption of smart solutions to improve wastewater management and to reduce energy consumption in small-medium regional airports. The mid-term strategy of Abruzzo Airport is to replace a diesel ground power unit with an electric ground power unit to reduce energy consumption for grounded aircraft activities.

Within ADRIGREEN project Abruzzo Airport has purchased an electric ground power unit to replace an old diesel ground power unit. Following the pilot action implementation, Abruzzo Airport has performed an assessment of the environmental impact and benefits for Abruzzo Airport, the travellers, and wider community. The environmental impact and benefits of the pilot action are described in latter stages of this report.

According to the environmental analysis, the present pilot action has reduced CO_2 and airborne pollutant emissions within the premises of Abruzzo Airport. Therefore, not only the Abruzzo Airport employees and passengers have benefited from the implementation of the pilot action, but also the local community and global environment.

Analysis performed within ADRIGREEN project gives clear understanding and recommendations to the Management Board of Abruzzo Airport for improvement of environmental management process in all different environment aspects. In this report energy fuel consumption is appraised for the pilot action implemented.

II. BACKGROUND OF THE PROJECT IMPLEMENTATION

Green and intermodal solutions for Adriatic ports and airports (ADRIGREEN) is a project approved under the INTERREG V-A Italy Croatia CBC Programme 2014-2020. The programme is funded by the European Regional Development Fund under the European Territorial Cooperation objective during the programming period 2014-2020.

Project description:

One of the main problems that characterize the Adriatic coastal area is the imbalance in the development of infrastructures and modes of transport, caused by low level of investments and insufficient approach to innovation. In Italy and Croatia there are many maritime cities, which deal with a very high number of passengers, especially during the peak season. Even though the road transportation is still predominant, the number of people that are reaching Adriatic cities by ferries and airplanes is significantly increasing year by year. However, most of Adriatic ports and airports are suffering from lack of integration with various modes of transportation, causing serious traffic congestion problems during the summer season.

The aim of the project is to improve the integration of Adriatic ports and airports with other modes of transportation by testing several intermodal operational and technological solutions. By identifying and analysing already existing procedures, the project partners will test several intermodal practices to evaluate their adaptability and transferability into the Programme area.

Also, it is very important to create more environmental-friendly and less polluting port and airport activities by reducing greenhouse gas and airborne pollutant emissions. This can be achieved by replacing fossil fuelled equipment with electric ones in port/airport premises.

Background of project implementation

ADRIGREEN project consists of several technical work packages as follows:

1. WP T1 – Identification of innovative solutions and action plan definition
2. WP T2 – Testing phase
3. WP T3 – Networking and training on green and intermodal solutions

WP T1 – identification of innovative solutions and Action plan definition

Within first technical work package (WP T1) several activities were performed:

A) Replicability research and analysis of replicable operational and technological solutions
B) Environmental assessment
C) Joint Action plan definition

Activities have been started in June 2019 and finalised as of December 2020.

A) Replicability research and analysis of replicable operational and technological solutions

Partnership has made a general overview of existing solutions for lowering airports/ports environmental impact and for intermodal connection of ports/airports with other means of transportation. To assess current situation and fields for improvement, an analysis of strengths, weaknesses, opportunities and threats (SWOT) was performed for each project partner. Also, international investigation research was conducted to identify and analyse the best solutions already implemented worldwide that can be easily implemented in the Adriatic region. One of the focus areas of international investigation included on-going operational and technical initiatives for making ports/airports environmentally friendly with particular attention to maintenance activities. Summary of practical sustainable applications to achieve carbon reductions at airport infrastructures are as follows:

Solution	**Brief description**	**Airport reference case studies**
Solar panels	Solar panels installed in different areas of the port/airport (e.g., rooftops of buildings and warehouses) for generating renewable energy.	Copenhagen, and Helsinki Airport
Geothermal	Renewable thermal energy for large heating and cooling loads. Cooling/heating system employs a water-based thermal energy storage system that stores heat/cold in ground- water reservoirs.	Paris-Orly, Nashville, Calgary, Stockholm-Arlanda, and Copenhagen Airport

heat pump/ Aquifer thermal energy storage[1]		
Energy monitoring system	Monitoring system of the energy consumption of airport/port equipment, buildings and other facilities for supporting decision-making and implementation of measures for improving energy efficiency.	Copenhagen Airport
Daylighting strategy	A daylighting strategy can reduce electricity for lighting and peak electrical demand, cooling energy and peak cooling loads, maintenance costs associated with lamp replacement, and electrical service to the building. Maximize south glazing and minimize east- and west-facing glass[2].	Denver, and San Francisco Airport
Green roofs	Green roofs are covered with vegetation and a growing medium planted over a waterproofing membrane. When weight restrictions need to be considered, it is possible to utilize substrates that provide an adequate nutrient supply with relatively low specific weight. Main environmental goals: absorbing rainwater, providing insulation, and helping to mitigate the heat island effect in the built environment.	Frankfurt, Ibiza, Munich Airport, Paris Orly, and Bordeaux–Mérignac Airport
Concrete pavement instead of asphalt	Pavers are lower maintenance and generally have a longer lifespan compared to asphalt.	-
LED	Light emitting diode (LED) is a highly energy efficient lighting technology.	Stockholm Arlanda, Copenhagen, Schiphol, and Oslo Airport

[1] Baxter et al. (2018). An assessment of airport sustainability, Part 2—Energy management at Copenhagen Airport. *Resources*, *7*(2), 32.

[2] https://www.lrc.rpi.edu/programs/daylighting/pdf/guidelines

Source: international investigation ADRIGREEN

According to International investigation ADRIGREEN document, main objectives of using electrical ground power units in airside areas are as follows:

- savings in fuel,
- reduction of carbon footprint, NO_x, and other airborne pollutants,
- reduction of noise emissions.

Electrical ground power unit improvement on

Weaknesses	Improvement
Contribution to the environmental pollution of the area	Very high
Conflicts between airport operations and existing land uses	High
Small to medium airports	Medium

Source: international investigation ADRIGREEN

SWOT strategies

Converting W into S	Lower cost per kWh makes this option profitable for airlines and potential revenues for the airport.
Converting S into W	The technological innovation in the aviation sector may request frequent technological updating of ground-based systems.
Converting T into O	The use of auxiliary power units may be subject to certain restrictions imposed by the airport.
Converting O into T	Possible reforms in safety and environment regulations could bring in stricter compliance norms about airborne pollutant emissions and noise emissions from aircraft on terminal stands.
Matching O to S	Reduction in noise emission and airborne pollutant emissions at the apron increase customer satisfaction of the airport.
Avoid T and W	The provision of ground services such as fixed electrical ground power may make the airport not fit potential fluctuation in the aviation market.

Source: international investigation ADRIGREEN

For more details, please see the International investigation ADRIGREEN document.

B) Environmental assessment

Next step in project implementation comprised of producing Environmental Impact Assessment (EIA) for each project partner based on ad-hoc guidelines produced by technical expert in the project, Polytechnic University of Marche. In order to assess the current situation for each partner, evaluation grid for EIA was produced to cover different environmental aspects such as local air quality, waste and water management, energy consumption, carbon footprint and noise pollution.

There are different levels of implementation of efficient environmental management within ADRIGREEN airports as can be summarised in table below:

Activity	Implemented in airports
Water management	
Education and training of airport staff	4/6
Monitoring of water consumption	3/6
Harvest and reuse rainwater	2/6
Surface water and groundwater quality monitoring	4/6
Runoff water management	5/6
Waste management	
Waste handling – more fractions (paper, metal…)	3/6
Aircraft waste advanced handling	1/6
Waste prevention initiatives	1/6
Training on recycling	2/6
Mitigation measures in place	3/6
Electricity and fuel consumption	
Photovoltaic systems installed	3/6
LED lighting	6/6
Operational and maintenance procedures in place	5/6
Initiatives to reduce energy consumption	3/6
Energy audit	2/6
GHG emission–high (0.2-0.3 kg CO2eq/pax)	4/6
Switch to electrical or bio-fuel vehicles	4/6
Charging stations	5/6

Data extracted from: ADRIGREEN WP3-D2 APT

For more details, please see the EIA ADRIGREEN document.

C) Joint action plan definition

Joint action plan definition has been produced by Polytechnic University of Marche with recommendations for improvement for each type of environmental activity (*please see: Adrigreen_WP3_D3_200218_Final*):

Since Abruzzo Airport pilot action comprises of *"*adoption of smart solutions to improve waste&water management and to reduce energy consumption in small-medium regional airports*"* below are presented reference case studies for actions aimed at decreasing energy consumption:

General measure	**Specific action**	**Metrics**	**Airport reference case studies**
Decreasing energy consumption	Building management system	Total energy consumed (electricity consumption (kWh); fuel consumption (m3; l; kg)); GHG emissions (kg CO2eq/m3; kg CO2eq/passenger)	Abruzzo Airport.
Decreasing energy consumption	Cogeneration plant	Total energy consumed (electricity consumption (kWh); fuel consumption (m3; l; kg)); GHG emissions (kg CO2eq/m3; kg CO2eq/passenger)	Website of Leonardo da Vinci Airport (—); Malpensa Airport (SEA Energia 2019).
GHG = Greenhouse Gases.			

Source: Adrigreen_WP3_D3_200218_Final

Therefore, within ADRIGREEN project Joint action plan definition, following measures were underlined regarding decreasing of fuel consumption:

General action	Specific action	Metrics	Airport reference case studies
Decreasing fossil fuel consumption	Purchase of electric vehicles (e.g., electric aircraft tug, electric baggage tractor, etc.)	Electricity consumption (kWh) versus kg or l of fossil fuel; GHG emissions (CO2eq)	Copenhagen Airport (2018).
Decreasing fossil fuel consumption	Provide charging stations for electric vehicles	Electricity consumption (kW); GHG and airborne pollutants emissions	Helsinki Airport (Finavia 2019).
Decreasing fossil fuel consumption	Anti-idling communication campaign	GHG and airborne pollutants emissions	Copenhagen Airport (2018).
Decarbonizing fuel consumption	Use of alternative renewable fuels (diesel from waste and residue) for diesel vehicles	Consumption of renewable fuel vs fossil fuel (l); GHG emissions (CO2eq)	Helsinki Airport, and other Lapland Airports (Finavia 2018).
GHG = Greenhouse Gases			

Source: Adrigreen_WP3_D3_200218_Final

To achieve the reduction of fossil fuel consumption, within ADRIGREEN project Abruzzo airport purchased an electric ground power unit to replace an old ground power unit. Therefore, the pilot action implemented by Abruzzo Airport is in line with recommendations specified in Joint Action plan definition.

WP T2 – Testing phase

Testing phase is the core phase of the project since identified solutions and best practices are to be put in place and tested within each partner pilot action.

Initial financial and environmental assessment of Abruzzo Airport pilot action demonstrated feasible and sustainable plan for reducing fossil fuel consumption and CO2 emission by replacing old diesel fuelled ground power unit with an electric one.

The needs analysis, pilot action implemented and environmental analysis of Abruzzo Airports are explained in latter stages of this document.

III. ABRUZZO AIRPORT NEEDS ANALYSIS SUMMARY

Abruzzo Airport's main objective is to stimulate the development of air traffic by encouraging carriers to operate new routes and upgrade existing ones, to implement a continuous development of the airport and to promote economic growth of the Region of Abruzzo.

Abruzzo Airport is especially interested in opportunities to implement new innovative technologies according to the latest environmental and sustainable development principles. To cope with new environmental challenges, Abruzzo Airport has planned to increase the level of environmental performance at the airport with dedicated project.

The ADRIGREEN project represents a unique opportunity for Abruzzo Airport to continue its development towards environmentally friendly and sustainable airport activities.

The Airport of Abruzzo is not using any electrical equipment in the airside area for aircraft handling operations, and this is causing a considerable impact (e.g., noise pollution, airborne and greenhouse gas emissions). It has been proved that electrical ground power unit could considerably improve the environmental performances of the airport.

To achieve the reduction of fossil fuel consumption, within ADRIGREEN project Abruzzo Airport pilot action includes purchasing of an electric ground power unit to be used in the airside area, covering the following pilot action field:

- adoption of smart solutions to improve wastewater management and to reduce energy consumption in small-medium regional airports.

The new solution adopted at the Airport will reduce the emission of noise, airborne pollutants and greenhouse gases. Gained experience and benchmark information will provide inputs for future sustainable development of the whole region.

The testing action will improve the current situation and lay the ground for further investments and activities coherent with the multiannual strategy of Abruzzo Airport. The project will also strengthen the collaboration with local private and public companies and stakeholders such us public transportation companies, tourist operators and private transportation companies. In addition, the training activities will significantly improve the knowledge of employees in relations to technological solutions and procedures for more sustainable management of the airport facility.

Thanks to the project, the Airport will analyse and evaluate existing and future strategies, concepts and technologies to improve intermodal and environmental solutions. Gained experience and benchmark information will provide inputs for future sustainable development of the whole region.

This is just the first step for Abruzzo Airport to increase the level of environmental performance through several dedicated projects, as photovoltaic solutions, electrical vehicles and led panels, to decrease carbon footprint of the airport activities.

IV. DESCRIPTION OF PILOT ACTION IMPLEMENTED

Abruzzo Airport pilot action consists in replacing an old diesel fuelled ground power unit with an electric one for aircraft handling operations.

According to the need's analysis performed, Abruzzo Airport has identified the following fields for improvement in airside area:

- energy efficiency improvements within airport processes,
- cost effective optimisation of business processes,
- reduction of airborne pollutants and greenhouse gas emissions.

The old diesel equipment is going to be replaced and put out of function whit the purchase and implementation of the electric equipment for aircraft handling operation. This pilot action will reduce energy consumption in performing daily processes within Abruzzo Airport airside area. Therefore, significantly lower airborne pollutant and greenhouse gas emissions are expected for the aircraft handling operations at Abruzzo airport.

Moreover, this new electric equipment will be visible to the airline companies and travellers improving the dissemination of the green and sustainable policy implemented at Abruzzo Airport.

V. ENVIROMENTAL ANALYSIS

Financial analysis

Abruzzo Airport has performed financial analysis of equipment purchased. In conducting financial analysis following assumptions were taken into the consideration:

- purchase price of new electric ground power unit,
- for the electric ground power unit, the replacement of a battery every 5 years (€ 5,600) is considered, while for the diesel ground power unit an extraordinary maintenance for engine is estimated around the 8th and 9th year (5,000 €),
- economic life usage period of the equipment (10 years),
- in 2019, the diesel fuelled ground power unit was used for about 1,000 h, and a consumption of 13.500 l of fuel, for a total fuel cost of about 14,000 €,
- based on data provided by the supplier, electric GPU has an estimated consumption of 26.3 kWh.

- the electric ground power unit will be used for aircraft handling operations. Therefore, the evaluation of usage over a ten-year period is based on traffic forecasts.

Other information:

- electric equipment was purchased in October 2021. It will likely be put in use in December 2021.

According to financial analysis, purchase of electric ground power unit is more feasible on respected period. Financial analysis is presented in Feasibility study for Abruzzo Airport pilot action, for more details please see related document.

Environmental analysis

Environmental analysis has been performed in two major steps:

1. Initial environmental analysis within FS of Abruzzo Airport pilot action

Within feasibility study for Abruzzo airport pilot action, initial environmental analysis has been performed according to basic calculation of CO2 and airborne pollutant (i.e., NOx and PM10) emissions based on the technical specifications of the equipment purchased compared to the one replaced.

Accordingly, listed below are technical specifications of pilot actions:

- Old diesel ground power unit (Ates 690, HOUCHIN) – on a yearly basis, fuel consumption of about 13500 l would result in about 3562 kg CO_2 (CO2 emission factor of 3160 kg CO_2/t fuel), 368 kg NOx (NOx emission factor of 32629 g NOx/t fuel), and 24 kg PM10 (PM10 emission factor of 2104 g PM10/t fuel);
- Electric ground power unit (ITW GSE 7400 Mobile), the emission factor was 269 g CO_2/kWh and no local emissions of NOx and PM10.

2. Environmental analysis based on evaluation grid for specific pilot action

Next step in conducting environmental analysis included development of evaluation grid based on the specifics of the pilot action implemented and type of equipment purchased.

Evaluation grid has been developed by Polytechnic University of Marche based on methodology provided by European Environment Agency (*1.A.4 Non road mobile machinery 2019*) (Ntziachristos et al. 2019).

Main purpose of evaluation grid and appraisal report is to asses pilot action performance and to show how the environment and transit of passengers benefited from pilot actions.

Emissions of airbonre pollutants (NO_x and PM_{10}) and CO_2 deriving from a diesel-fuelled ground power unit

For the use of a diesel-fuelled ground power unit, the emissions of NO_x, PM_{10}, and CO_2 were evaluated following Tier 1 according to Ntziachristos et al. (2019), as follows:

$$E_i = \sum_j EF_j \times FC_j \times \frac{d}{1000}$$

where E_i is the emission value of NO_x [g], PM [g], and CO2 [kg]; EF_j is the emission factor specific for the type of fuel (Table 1), [g/t fuel] for PM and NOx; [kg CO_2/t fuel] for CO_2; FC_j is the yearly fuel consumption related to the old ground power unit (Table 2) [l]; d density of diesel fuel, 0.835 [kg/l]; $\frac{1}{1000}$ is for converting kilograms to tonnes of fuel.

Table 1 Tier 1 emission factors for ground power unit (off-road machinery); adapted from Ntziachristos et al. (2019).

Sector	Fuel	Airborne pollutants and CO2	Unit of emission factor	Emission factors
Industry	Diesel	NOx	[g/t fuel]	32,629
Industry	Diesel	PM10	[g/t fuel]	2,104
Industry	Diesel	CO2	[kg CO2/t fuel]	3,160

Table 2 Yearly fuel consumption of the old diesel-fuelled ground power unit (source: Abruzzo Airport).

Vehicle category	Diesel fuel consumption [l]
Ground power unit	13,500

Emissions of greeenhouse gases deriving from an electric ground power unit

For the electric ground power unit, the CO2 emission (E_i) was evaluated as follows:

$$E_i = \sum_j EF_j \times EC_j$$

where EF_j is the emission factor of 269 g CO2 /kWh that was determined for Italy (European Investment Bank 2020); EC_j is the yearly mean electricity consumption related to the utilization of the electric GPU [kWh].

For the electric GPU that was purchased under the Adrigreen project, Abruzzo Airport estimated the utilization of about 1,825 hour per year with a yearly mean electricity consumption of about 48,000 kWh.

Results

Replacing the use of a diesel-fuelled ground power unit with an electric ground power unit represents a solution for reducing the CO2 footprint and local airborne pollutants emissions (PM_{10}, and NO_x) during turnaround operations. Lower or no noise emissions come from the utilization of the electric ground power unit. Therefore, the implementation of the pilot action is expected to bring benefits to the Abruzzo Airport employees, passengers, and the local community because of reduction of local emissions of PM10, NOx and noise. Moreover, the reduction in greenhouse gas emissions (i.e., CO_2) will benefit the global environment.

According to the World Health Organization (WHO 2006), adverse health outcomes are attributable to exposure to ambient airborne pollutants such as particulate matter, ozone, nitrogen dioxide, and sulfur dioxide. For example, according to the Air quality in Europe 2020 report (EEA 2020), in Italy 10,400 premature deaths were attributable to the exposure to annual mean NO_2 concentration of 20.1 µg/m^3.

Each year, the utilization of the diesel-fuelled ground power unit would result in emitting about 2.8 times the greenhouse gases deriving from the electricity related to the use of the electric ground power unit at Abruzzo Airport (Figure 1).

Local emissions of airborne pollutants such as NOx and PM10 are assumed to be null for the electic ground power unit. However, the emission of airborne pollutants should be considered depending on the location of production and the technology utlised for producing electicity.

On the contrary, utilising the diesel-fuelled ground power unit would result in local emissions of NOx and PM10 (Figure 2).

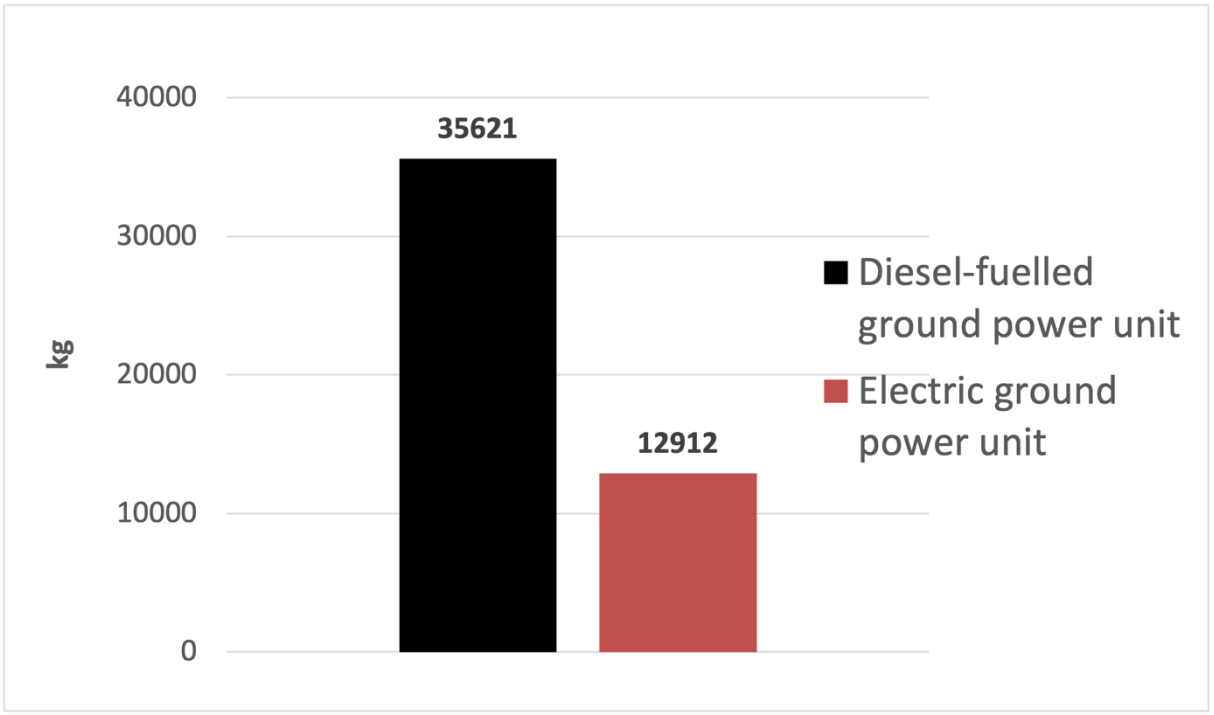

Figure 1. Comparison between greenhouse gases (CO2) emissions deriving from diesel-fuelled and electric ground power units per year.

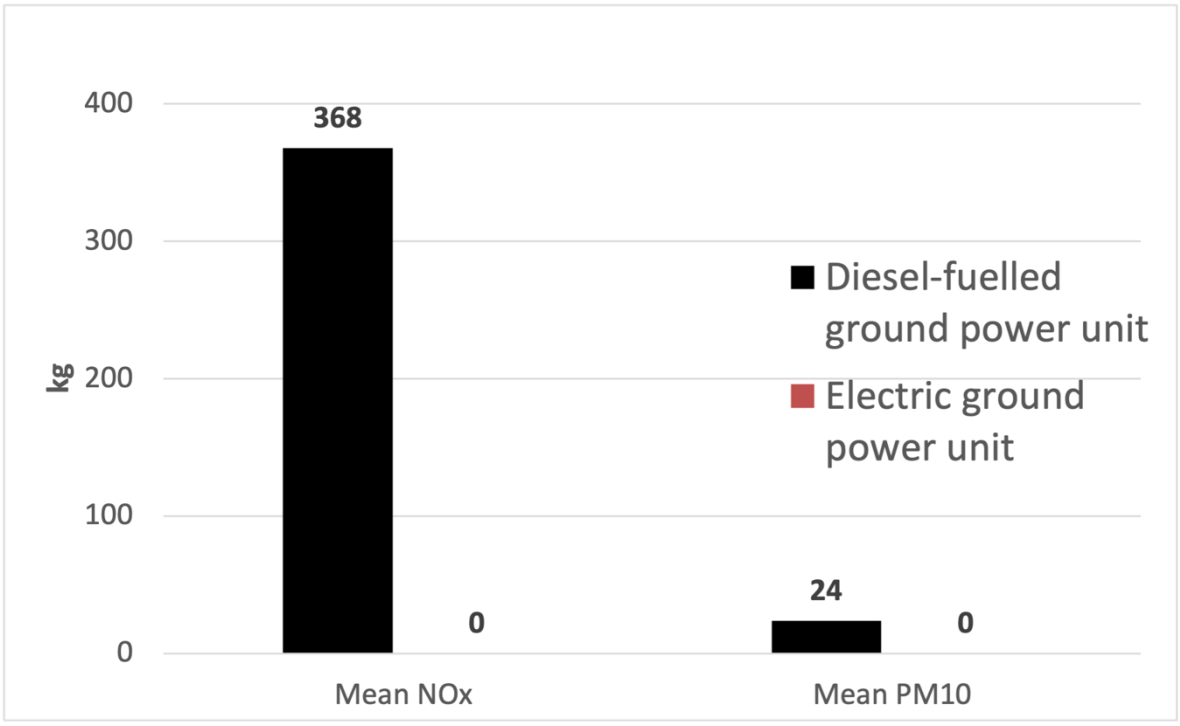

Figure 2. Comparison between local emissions of airborne pollutants (i.e., NOx and PM10) deriving from diesel-fuelled and electric ground power units per year.

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VI. ANNEX I – TECHNICAL SPECIFICATIONS

Figure 3. The technical specifications of the electric ground power unit (part1) purchased at Abruzzo Airport.

SPECIFICHE

eGPU ITW GSE 7400 - 90 - 140 - 180 kVA

ISO 6858: 2017(E) IN COMPLIANCE WITH ITW GSE 7400 eGPU

Zero Emission

Ingresso

- Gamma di ingresso caricatore: trifase a 260-520 V / 45-65 Hz

Tempo di carica (basato solo sulla ricarica)

		4 pacchi batteria (180 kWh)	5 pacchi batteria (310 kWh)
Presa a muro	16 A	< 15 h	
	32 A	< 8 h	
	63 A	< 4 h	
	125 A	< 3 h	< 5 h
	200 A		< 4 h

Valori per 3 x 400 V e temperatura ambiente 20 °C

Uscita

- Potenza nominale: 90 kVA; 140 kVA; fattore di potenza unitario 180 kVA
- Tensione: 3 x 115/200 V
- Frequenza: 400 Hz ± 0,1%
- Fattore di potenza: da 0,7 in ritardo a 0,95 in anticipo
- Regolazione della tensione: < 0,5% con carichi bilanciati e fino al 30% con carichi sbilanciati
- Recupero tensione: Δ < 8% e tempo di recupero < 10 ms con variazione di carico del 100%
- Contenuto di armoniche totale: < 2% a carico lineare (tipico 1,5%) < 2% a carico non lineare secondo la norma ISO 1540
- Fattore di cresta: 1,414 ± 3%
- Modulazione della tensione: < 1,0%
- Simmetria angolare di fase: 120° ± 1° per carichi bilanciati 120° ± 2° per carichi sbilanciati al 30%

Protezione

- Classe di protezione: IP55
- Trasferimento del carico senza interruzione
- Sovra e sottotensione in uscita
- Sovraccarico
- Sovratemperatura interna
- Errore di tensione di controllo
- Cortocircuito su uscita
- Interblocco inserimento spina
- Supervisione tensione neutro
- Spostamento tensione neutro
- Supervisione corrente di dispersione

Valori di sovraccarico

- Secondo norma ISO 6858:2017

Soste a terra in base a tempi e aeromobile

In base al consumo medio misurato e al modello di aeromobile.		Tempo a terra in minuti 40	60	80
Narrow Body Unità 1 x 90 kVA	CRJ-900LR	16	11	8
	A320-200	15	10	9
	A321-200	8	5	4
	B737-800	10	6	5
Narrow Body Unità 2 x 90 kVA o Unità 180 kVA (310 kWh)	A340		6	5

A seconde delle condizioni ambientali e d'uso, la capacità può ridursi fino al 30% in 10 anni

Norme e standard

- DFS400 Specifiche dell'alimentazione a 400 Hz degli aeromobili
- MIL-STD-704F Caratteristiche dell'alimentazione elettrica degli aeromobili
- SAE ARP 5015 Attrezzature di supporto al suolo - Parametri di prestazioni delle attrezzature a 400 Hz
- ISO 6858:2017 Alimentazione elettrica al suolo degli aeromobili
- EN 62619:2017 Requisiti di sicurezza per batterie agli ioni di litio
- UN38.3 Sistema di batterie certificato
- EN 62040-1-1 Prescrizioni generali e di sicurezza
- EN 61558-2-6 Prescrizioni generali e di sicurezza
- EN 61000-6-4 Compatibilità elettromagnetica Norme generiche - Norma sulle emissioni
- EN 61000-6-2 Norme generiche EMC
- EN 1915-1 e 2 Macchine - Prescrizioni generali e di sicurezza
- EN 12312-20 Macchine - Prescrizioni generali e di sicurezza

Peso, Unità mobile

- 90 kVA (160 kWh): 2.475 kg (5.456 lb)
- 140 kVA (248 kWh): 3.680 kg (8.113 lb)
- 180 kVA (310 kWh): 4.200 kg (9.259 lb)

Requisiti ambientali

- Temperatura di esercizio: da -10 °C a 45 °C (da 14 °F a 113 °F) senza riscaldamento/raffreddamento aggiuntivo. Per altre temperature operative, contattare ITW GSE Umidità relativa: 10-100%
- Rumorosità: < 65 dB(A) a 1 m - tipico 60 dB(A)

Rendimento

- Convertitore e caricatore a 400 Hz > 0,95

Varie

- MTTR (tempo medio di riparazione): 20 minuti max Colore: RAL 7035, grigio chiaro (standard) Rimorchio: RAL 7043, grigio traffico Copertura posteriore: Pantone 2393, blu Cleantech

Funzioni standard/apparecchiatura

- Compensazione automatica della tensione Plug & Play (con una sola uscita attiva)
- Impostazioni corrente di ingresso max regolabili 90 kVA: da16 a 100 A con incrementi da 1 A 140-180 kVA: da 16 a 200 A con incrementi da 1 A
- Indicatore luminoso di funzionamento/carica*
- Indicatore luminoso di avviso/livello basso batteria* con sirena
- Interblocco barra di traino (versione senza il fermo)
- Carica simultanea con alimentazione a 400 Hz

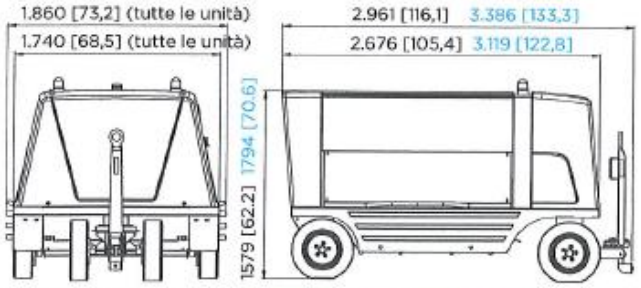
*Colore secondo le specifiche del cliente

Opzioni standard disponibili

- Doppia uscita: opzionale per GPU per aeromobile Narrow Body Standard su GPU per aeromobile Wide Body
- Cavo e spina di ingresso in base a specifiche cliente
- Cavo in uscita 4 x 50 mm2 (AWG 1/0) (consigliato)
- Interblocco barra di traino con fermo applicabile
- Barra di traino con occhiello DIN40
- Luce d'ingombro bianca
- ITW Connect con APP & Data Manager (dati/posizione su GSM/GPS)

Le seguenti opzioni sono solo per aeromobile Narrow Body

- ARU (Automatic Rectifier Unit) 28 V CC/600 A Uso simultaneo a 45 kW (CA)
- Possibilità di utilizzare un altro generatore come fonte di alimentazione per il 7400 in caso di sosta a terra più lunga del previsto
- Modulo estensione gamma (vedere brochure specifica)
- Vano ricavato sotto il muletto per eventuali trasporti



Dimensioni espresse in mm e [pollici]. I numeri in blu si riferiscono a GPU per fusoliera stretta.

Specifiche soggette a modifiche senza preavviso

It's all about connections

ITW GSE

Marzo de 2021 - M13043

Figure 4. The technical specifications of the the diesel fuelled ground power unit replaced at Abruzzo Airport, (part1).

Performance

Model Type	kVA Rating	Continuous Peak Overload kVA	Engine	Cylinders	Engine Type	Fuel Type	Electrical System	Cooling System	Coolant
C690 C690	90 100	112 112	Cummins QSB 160BHP	6	4 Stroke Turbo Charged	Diesel	24 Volt	Tropical Radiator and Fan	Water
C690	140	154	Cummins QSB 215BHP	6					

Features Applying To All Models

Voltage Range	115/200 Volts
Phase	3
Hz	400
Power Factor	0.8 cos Ø
Voltage Regulation	+/- 1% (steady state)
Voltage Transient	+/- 20% (100% load change)
Transient Recovery	0.2 secs.
Frequency Regulation	+/-2Hz (steady state)
Frequency Transient	+/-10Hz (100% load change)
Transient Recovery	1.0 secs.
Peak Load	110% continuous at 0.8 p.f

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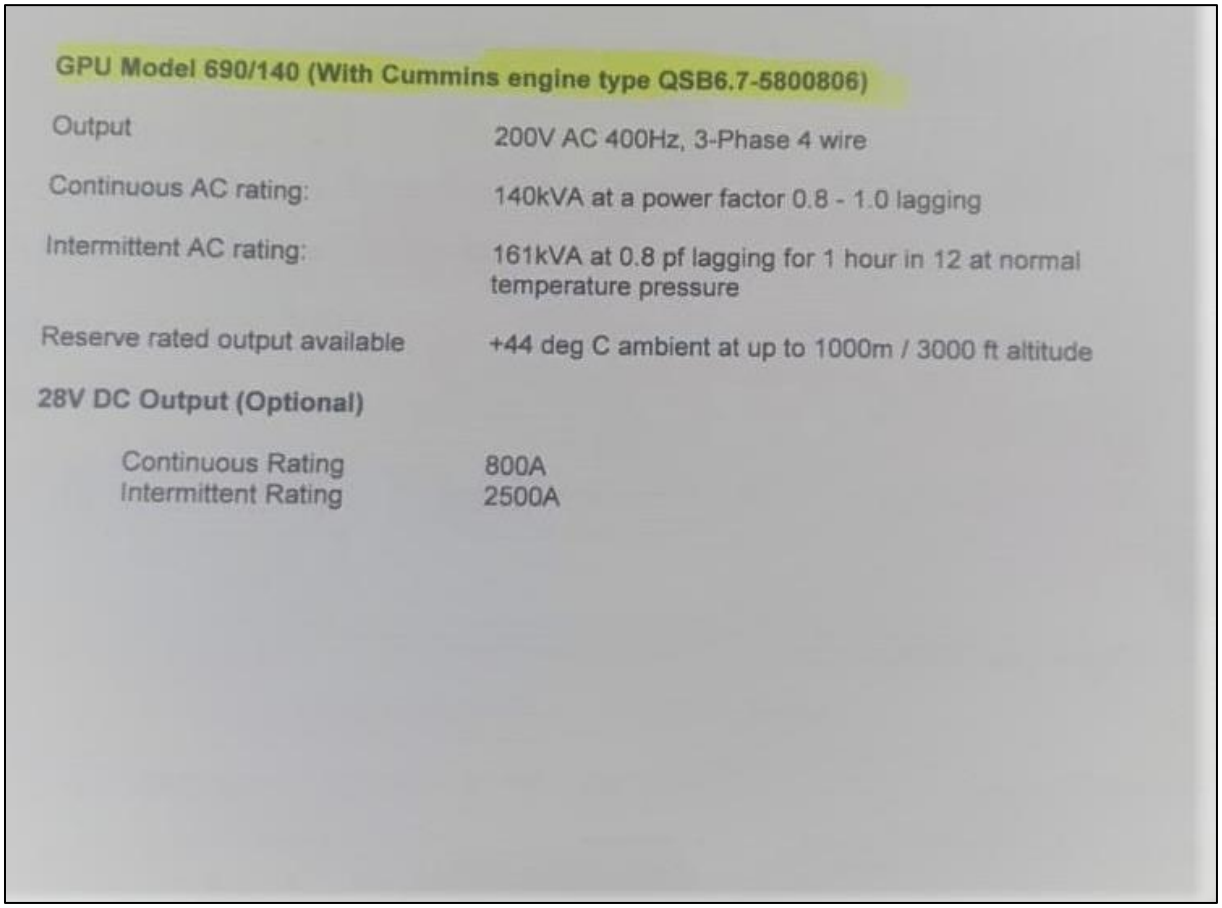
Figure 5. The technical specifications of the diesel fuelled ground power unit replaced at Abruzzo Airport, (part2).



GPU Model 690/140 (With Cummins engine type QSB6.7-5800806)

Output	200V AC 400Hz, 3-Phase 4 wire
Continuous AC rating:	140kVA at a power factor 0.8 - 1.0 lagging
Intermittent AC rating:	161kVA at 0.8 pf lagging for 1 hour in 12 at normal temperature pressure
Reserve rated output available	+44 deg C ambient at up to 1000m / 3000 ft altitude

28V DC Output (Optional)

Continuous Rating	800A
Intermittent Rating	2500A

VII. ANNEX II – PICTURES

Figure 6. Electric ground power unit purchased at Abruzzo Airport.

Figure 7. Diesel fuelled ground power unit replaced at Abruzzo Airport.