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**OUTCOME OF THE GREECE-ITALY REGULATORY
AUTHORITIES INQUIRY**

ABOUT

**THE CAUSES OF UNAVAILABILITY OF THE GREECE-
ITALY INTERCONNECTION**

30 November 2021

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I. Introduction

This document summarizes the main steps and conclusions of the inquiry jointly run by the Greece-Italy Regulatory Authorities (hereinafter referred to as “GRIT NRAs”) about unavailability of the Greece-Italy interconnection.

It provides evidence of the improvements implemented by the involved TSOs and includes some recommendations for future analysis with the aim to further enhance the reliability of the interconnection.

II. The inquiry

The Greece-Italy interconnection faced frequent periods of unavailability since 2013. In March 2018, considering that a proper reliability of the interconnection is a key factor for the effective implementation of the market coupling between Greece and Italy, the GRIT NRAs decided to run an inquiry to detect the reasons behind unavailability and to identify proper measures to improve availability for the future. In particular Arera launched a formal fact-finding survey with the Decision 158/2018/E/eel.

The inquiry was run as follows:

- a) Each NRA gathered some information from its TSO about the duration and reasons of each period of unavailability occurred since 2012; the data were compared and a high level of consistency was identified;
- b) Following another fault on the cable occurred in September 2018, Arera interacted with Terna in order to understand the reasons behind this failure and in order to monitor the duration of the restoration activities;
- c) The information collected pursuant to letter b) were discussed by the GRIT NRAs that decided to ask the TSOs for a detailed maintenance plan for 2019/2020 to prevent similar fault events in the future; a joint letter was sent in January 2019 and the TSOs answered in March 2019;
- d) Arera in July 2020 collected some further information about the unavailability and the curtailment occurred in 2018 and 2019 in order to have a complete picture of the situation and check for the effectiveness of the maintenance plan proposed by the TSOs;
- e) Following a new fault on the cable in July 2021, further data on 2020 and 2021 unavailability and curtailment were requested by Arera to Terna in order to complete the set of information.

III. The main reasons behind unavailability

The analysis focused on the period 2012-2021, during which the cable was characterized by ordinary and extraordinary maintenances and by a number of fault events, some of them leading to quite long lasting unavailability.

Maintenance issues

The cable undergoes three-four weeks of ordinary maintenance a year. Recently this period has often been extended by one week to allow for the execution of further repairs detected during the ordinary work.

In 2013 and 2014 an extraordinary maintenance on the earth joints in the Italian section between Galatina and Otranto was planned: the earth joints had been showing an increased fault rate for months and after a dedicated inspection an unexpected early deterioration was identified. All the components were replaced with new ones, equipped with a modern and efficient monitoring system to prevent further unexpected fall in the future.

Unplanned outages

Along with a bunch of minor events, 5 main faults occurred.

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In 2013 the reactor in Galatina failed and needed to be replaced. The cable was out of service for one month.

In 2015 a fault in the sea cable near the Greek coast occurred: the affected section was replaced, the intervention was completed in a couple of months, of which 16 days were effectively used for the working activities and the remaining ones were exploited to procure and arrange the vessel needed for off-shore operation.

In 2016 the earth-sea joint in Galatina failed. It was completely rebuilt and a new monitoring system was installed to detect early failures. The intervention was completed in three months.

In 2017 the cable was cut by an external mechanic action (likely an anchor). Two months were required to restore the interconnection, most of which dedicated to the procurement and arrangement of a proper off-shore vessel.

In 2018 an electric fault to the sea-cable near the Italian coast occurred: the proximity to the land worsened the restoration activities since both an off-shore vessel and a dedicated facility to work close to the shore were required. The cable was restored after three months.

In 2021 two subsequent faults occurred leading to over 4 months of unavailability: a first fault occurred on the overhead line – cable joint on Greek side likely due to a fulmination: the problem was detected shortly before the starting of the ordinary maintenance period and it was solved by replacing the joint; the work lasted for over 6 weeks, during which the ordinary maintenance was performed as well as planned. Right when the cable was about to enter into service, a further fault was located on Greek side, close to shore, probably due to an external mechanical action that damaged the insulation. The fault was solved after two months.

IV. TSOs' actions

The TSOs reinforced the ordinary maintenance plan to better monitor the performances of the different devices composing the interconnection. Some visual inspections are also run on periodical basis to check:

- the status of the land cable between Galatina and Otranto;
- the status of the section of the sea-cable near Otranto where the cable is exposed to sea currents, waves and potentially external mechanical actions;
- the status of the DC-AC converter stations;

New monitoring system were installed on the joints of the land cable and on the earth-sea joint during the recent work on these components, while a complete refurbishment of the control and protection system is planned in 2023.

In 2019 the sea cable underwent an extraordinary monitoring campaign aimed:

- to evaluate the ageing of the infrastructure and plan potentially extraordinary maintenances
- to check the status of the seabed and evaluate the impact of the sea currents in Otranto area to improve the mechanical protection of the cable; in this area the infrastructure is protected by special cast iron shells and cannot be buried because of environmental constraints; different approaches are under evaluation.

Moreover, Terna:

- contracted a satellite monitoring system to check the transit of vessels along the cable marine route;
- is refurbishing the fault locator system to speed up the fault identification;
- is evaluating whether signing a repair agreement or purchasing a dedicated vessel to reduce the time to repair.

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V. GRIT NRAs' position

According to GRIT NRAs some specific remarks are worth being made.

The ordinary maintenance approach changed during the years: this led to extraordinary interventions on the land cable joints in 2013 and 2014 and on the earth-sea joint in 2016. The presence of new monitoring systems for these devices along with a wider ordinary maintenance in place since some years seems to have provided significant benefits to this extent, reducing the frequency of this fault event and improving the overall reliability of the interconnection, with a positive impact on the market outcome.

The impact of external mechanical actions and of the sea currents proved to be critical. The fault events in 2015, 2017 and 2018 were due to these factors. In this case the main drawback is given by long-lasting repairs, due to the need to procure and arrange specific vessels for off-shore interventions. Terna's actions (new mechanical protection approach in Otranto, satellite monitoring of traffic of vessels, advanced fault locator system, contract or purchase of a dedicated vessel) are expected to significantly improve the performances, both reducing the faulty rate and cutting the restoration time.

Nonetheless the experience gained since these new interventions are in place is too short: two years and half (2019, 2020 and S1 2021) with few and negligible fault events and unavailability followed by two close events in summer 2021, one of them again associated to an external mechanical action. GRIT NRAs are in principle fine with the measures improved so far, but more accurate conclusions on their effectiveness may only be reached in the coming years.

VI. Next steps

A proper monitoring of the maintenance activities shall remain in place to allow GRIT NRAs to check the effectiveness of the measures adopted so far. GRIT TSOs are thus required to send

- a) a yearly report about the ordinary maintenance (to be submitted within one month after the end of the ordinary maintenance period, as communicated to market participants during the yearly auction); the first edition is expected for the 2022 maintenance;
- b) dedicated information every time an unplanned outage occurs with an expected out of service lasting for more than two weeks; in this case a preliminary report shall be submitted within two weeks from the start of the unplanned outage followed by a monthly update about the ongoing restoration activities till the full operation is recovered; this request is applicable for any event occurring after the date of this letter.

Unplanned outages have a strong impact on the market, leading to a significant amount of compensation to the market participants holding long term transmission rights and any pro active measures with positive net benefit that can be implemented to reduce frequency and duration of such outages is more than welcomed. For these reasons GRIT NRAs ask the TSOs

- a) perform a cost-benefit analysis on these proactive measures with respect to the expected advantages in terms of quicker and more efficient restoration or in term of reduced fault frequency; the results shall be submitted by 31st July 2022;
- b) Submit a quarterly report on the status of the above-mentioned cost benefit analysis; the documents shall be sent by 31st December 2021, 31st March 2022 and 30th June 2022.