Annex 1 to the Ministerial Decree of 18th October 2017

Italian natural gas system's Preventive Action Plan[1]

[1] In compliance with article 8, paragraph 1 of Italian legislative decree no. 93/2011, and with the provisions of article 5 of the Regulation (EU) No. 994/2010

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1. DEFINITIONS

Authority: Regulatory Authority for Electricity, Gas and Water.

Committee: emergency and gas system monitoring committee, established according art. 8 of ministerial decree September 26th 2001.

Direction: Ministry of Economic Development, General Direction for security of supply and energy infrastructures (DGSAIE).

Crisis: means a critical situation of the gas system to the point that one or more levels (early warning, alert and emergency), as defined into the Emergency plan, are activated.

Main TSO: Snam Rete Gas S.p.A..

Ministry: Ministry of Economic Development.

Other terms used in the present PAP with capital letter, if not specified in the text, refer to the definitions of the regulations approved by Authority.

2. SCOPE AND LEGAL FRAMEWORK

1.1. Scope

The preventive action plan is prepared according to Legislative Decree n. 93 of June 1st 2011, keeping into account dispositions provided for by art. 5 of Regulation 994/2010 on Security of supply (Regulation hereinafter).

The document takes into account the indication of the Annex 5 of the proposal for a regulation of the European Parliament and of the Council concerning measures to safeguard the security of gas supply that, if approved, will repeal the Regulation (EU) No 994/2010 of the Council.

The preventive action plan includes:

1) the results of risk evaluation as per art. 9 of Regulation;
2) the measures, volumes, capacities and the timing needed to fulfil the infrastructure and supply standards, including where applicable, the extent to which demand-side measures can sufficiently compensate, in a timely manner, for a supply disruption; the identification of the single largest gas infrastructure and any other standard related to increase of supply, the alternatives used to obtain the conformity to the infrastructure standard and the indication about the existing bidirectional capacity;
3) the measures utilized to fulfil the supply standard and any other additional obligation imposed for security of gas supply reasons, the definition of the "protected customers, the related demand and the volumes that are necessary in order to satisfy their demand in different climatic scenarios, the description of the legislative measures for the protection of "protected customers";
4) the other preventive measures, such as those relating to the need to enhance interconnections between neighbouring Member States and the possibility to diversify gas routes and sources of supply, if appropriate, to address the risks identified in order to maintain gas supply to all customers as far as possible;
5) the existing import contracts, the Intergovernmental agreements, the development of the new regulatory devices useful to strengthen the security of the system and the supply from other country;
6) information on existing and future interconnections, including those providing access to the gas network of the Union, cross-border flows, cross-border access to storage facilities and the physical capacity to transport gas in both directions, in particular in case of emergency;
7) obligations imposed on natural gas undertakings and other relevant bodies, including those for the safe operation of the gas system, description of the subjects that must comply the obligations and of the relative modality, causes of the application of the obligations, the information about the public service obligations whit reference to the security of supply;
8) the mechanisms to be used for cooperation with other Member States for preparing and implementing joint Preventive Action Plans and joint Emergency Plans, where applicable.

1.2. Legal Framework

The Legislative Decree n. 93 of June 1st 2011 ("DLGS 93/11"), reporting "*Actuation of 2009/72/EC, 2009/73/EC e 2008/92/EC Directives relating to common standards for the internal market of electricity, natural gas and to community procedure on transparency of prices of electricity and natural gas final industrial customers, as well as abrogation of 2003/54/EC e 2003/55/EC directives*", delegate to the Ministry of Economic Development (hereinafter Ministry as Ministero dello Sviluppo Economico) the preparation of Plans provided for by art. 5 (Preventive Action Plan – PAP) and 10 of the Regulation (Emergency Plan – EP).

In particular art. 8 paragraph 1 of the decree establishes that "*Ministry of Economic Development provides for the evaluation of risks affecting security of supply of National natural gas system as per art. 9 of the Regulation […], and defines the preventive action plan and the emergency and natural gas system monitoring plan, keeping into account art. 5 and 10 of the Regulation, availing itself of the emergency and natural gas system monitoring Technical Committee, established by the Ministry of Economic Development itself*".

The 16th February 2016 the European Commission published the proposal for a regulation of the European Parliament and of the Council concerning measures to safeguard the security of gas supply that, if approved, will repeal the Regulation (EU) No 994/2010 of the Council. The regulation proposal focuses the attention on the strengthening of regional coordination and on the definition of plans that will be assessed and approved by Commission. The Annex 5 to the regulation proposal identify a model for the structure and the contents for Risk Assessment (RA), Preventive Action Plan (PAP) and Emergency Plan (EP)

Moreover, the regulation proposal, have the goal of improving the application of the supply standards of the protected customers and of the infrastructure standards. The two topic need to be addressed both in national and regional point of view.

The present document index and contents are compliant with the current law and regulation (according to art. 9 of the regulation 994/2010), furthermore takes into account the information of the Annex 5 of the proposal for a regulation of the European Parliament and of the Council concerning measures to safeguard the security of gas supply that, if approved, will repeal the Regulation (EU) No 994/2010 of the Council.

The *Risk Assessment, compliant to the art. 9 of the Regulation n. 994/2010 that identify* measures aimed at ensuring the security of the gas supply, has been forwarded to European Commission the 1st December 2011.

3. ITALIAN SYSTEM DESCRIPTION

2.1.Italian gas system demand

The historical annual gas demand by consumption sector (Figure 1) shows a gradual decrease. The main causes are to be found in the significant decline in gas demand from the power generation sector and in the contraction of consumptions from the industrial sector.

Specifically, the drop in gas demand from the power generation sector was determined by the internal dynamics of the electricity sector. Gas fired plants were penalized from:

- the decline in electricity demand;
- the consolidation of renewable generation;
- the competition from coal-fired plants.

Gas-fuelled electricity generation is currently less competitive than other sources, such as coal and renewables, due to the following factors:

- dispatching and price formation according to the economic merit order curve[2];
- incentives received from renewable sources;
- cost of CO_2, currently reduced.

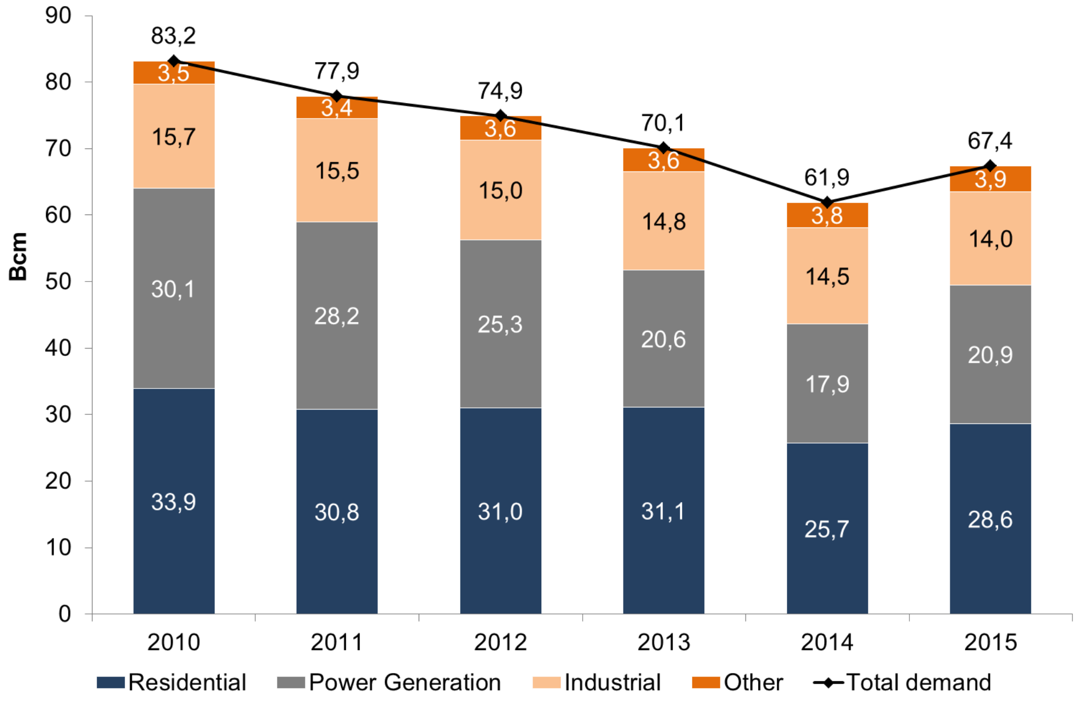
In 2015 natural gas consumption for electricity generation has returned to the level registered in 2013. The reduction which took place in 2014 (-14% compared to 2013) was strongly influenced by a condition of exceptional availability of hydroelectric generation compared to the normal condition. With the growth of non-programmable renewables the climate plays an increasingly significant role for the gas consumption of the electric power, as it increases the variability. The consumption of the residential and tertiary sectors registered in 2015 an increase vs. 2014 (+22%, equal to 5.7 Bcm). Such increase is linked to a recover of macro-economic conditions and to the exceptional conditions which took place in 2014, with an average temperature warmer of about 2°C resulted in a reduction of approximately 5 Bcm.

The daily demand peak occurred in February 2015 with 339,7 Mcm redelivered in a day.

[2] The economic merit order curve, in case of same offered price, is defined consistently with the following priority criteria:

- Essential units;
- Not Programmable Renewables;
- Programmable Renewables;
- Cogeneration units (including gas fired units);
- CIP6 units;
- Conventional plants (including gas fired plants);
- Bilateral contracts.

Figure 1 – Sectorial gas demand in Italy (Bcm)



Source: Ministry of economic Development on Snam data

2.2. Italian gas system supply

The domestic gas demand is met with:

- import supply sources for about 90% of total supply;
- national production for the remainder.

Italy has historically been a gas importing country, where exported volumes have so far represented a negligible part of transported volumes (about 0.3% in 2013, 0.4% in 2014 and 0.3% in 2015). There is however an expected increase of exports, with the availability of bidirectional capacity at Passo Gries interconnection point.

The national production shows a historical decreasing trend until 2016 due to the decline of domestic sources, not sufficiently offset by new production developments. The maximum daily production rate is about 20 MScm/d.

Imported natural gas came from[3]:

- Russia, with 45.0% of total imports;
- Algeria with 11.8%;
- and Libya with 11.6%.

Then follow Qatar, the Netherlands, Norway and others with lower percentages.

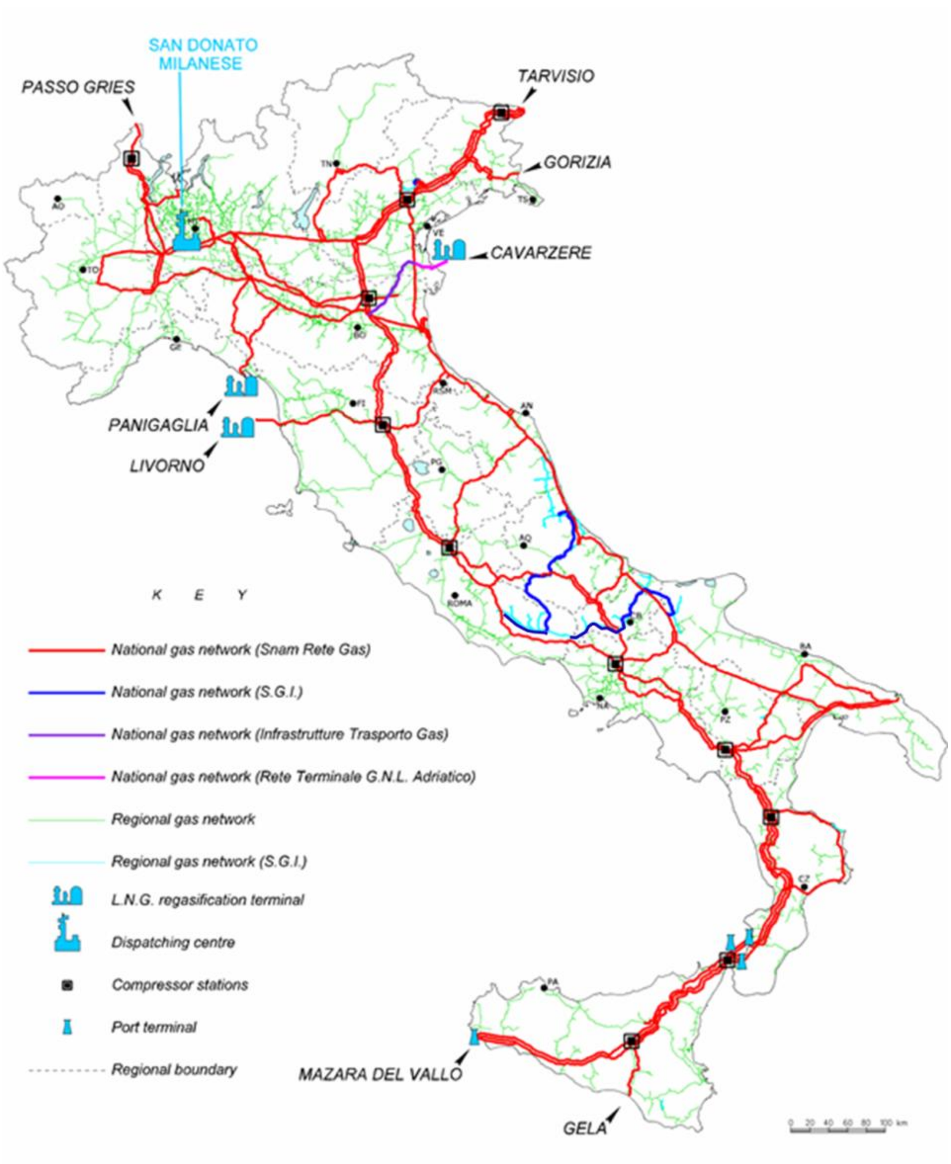
[3] Source: Ministry.

2.3. Italian gas infrastructure system

The transportation infrastructure, connected with the import pipelines, the LNG regasification plants, the national production and the storage sites, allows for the gas delivery to the distribution networks and to final customers directly connected, ensuring the coverage of the demand for gas in Italy. This network infrastructure (transportation and distribution), together with the regasification and storage plants, were developed and extended over the years, making the system extremely flexible when managing the flows, and robust when facing potential critical situations.

The infrastructure considered for the purposes of the risk assessment in this document comprises the gas transportation network[4], the LNG regasification terminals and the gas storage facilities as shown in Figure 2.

Figure 2 – System infrastructure



Source: Snam Rete Gas

[4] The distribution network is excluded.

2.3.1. Transportation

The Italian gas infrastructure system comprises a transportation network that extends for more than 32,000 km. The national network, consisting of major pipelines, junction nodes and compressor stations, is the main infrastructure of the gas transportation network, which runs through the Italian territory along three backbones from the northeast, the north and the south, as a natural extension of the import routes from Russia, Northern Europe and North Africa.

The transportation infrastructure is built in such a way that none of its parts, or systems, are critical to the Italian supply system. Most of the import lines have been duplicated or triplicated over time to meet the needs of new transportation capacity, and the compression stations always have a spare unit.

2.3.2. Regasification

In Italy there are three LNG terminals:

- the Panigaglia terminal (owned by the company "LNG Italia"), in operation since the early 1970s. This Terminal was for about 40 years the only active terminal in Italy with a capacity of about 3.5 Bcm per year and 11.4 Mcm per day;
- the terminal located off-shore Porto Levante (owned by the company "Adriatic LNG"), operating since the second half of 2009, is the world's first offshore structure in reinforced concrete, for receiving, storing and regasifying LNG with a regasification capacity of 8 Bcm per year and up to 26.4 Mcm per day;
- the off-shore terminal of Livorno OLT (owned by the company "OLT"), with a capacity of 3.75 Bcm per year and 15.0 Mcm per day. The plant was commissioned in the last quarter of 2013 and entered into operation in mid-December 2013.

2.3.3. Storage

The Italian storage system, entirely based on depleted natural gas fields converted to storage, is particularly developed, with a working capacity of approximately 16,7[5] Bcm, including 4.5 Bcm for strategic reserve.

The Ministerial Decree of 15 February 2013, and more recently the Ministerial Decree of 6 February 2015, has regulated storage use for ensuring adequate coverage of peak demand in times of greatest need. The provisions define new mechanisms for commercial allocation of storage withdrawal capacity, avoiding the risk of any excessive anticipated withdrawals that would not allow adequate system performance during the months of January and February.

The commercial peak, therefore, is lower than the technical peak, which corresponds to the maximum service in the absence of any plant unavailability and which can possibly be accessed for limited periods in the event of a supply emergency.

Withdrawal capacity for the modulation service is shown in Table1 (ref. Ministerial Decree 06 February 2015).

[5] Stogit: 16 Bcm; Edison: 743 Mcm

Table 1 – Withdrawal Capacity

[Mcm/day]	November	December	January		February	**Marzo**
Monthly capacity						
of which						
- Stogit	513*	900	2,500		1,750	580**
- Edison		414****			117	69**
Daily capacity						
of which						
Dates			1-7	8-31		
- Stogit	24.4***	29.0	67.6	84.5	60.3	18.7
- Edison		6			4.2	3.6

(*) The volume of November includes possible withdrawls for the month of October
(**) The volume of March includes possible withdrawls for the month of April
(***) For November, the maximum daily volume is obtained by dividing the monthly maximum for 21 days
(****) The Volume in the quarter from November to January is including any provision required for the month of October

Source: Ministerial Decree 6 February 2015

2.4. Interactions between gas and electricity markets

In 2014 the Italian electric generation has been 269 TWh. The 34% of electricity generation came from gas-fuelled plants, showing a decreasing trend when compared to previous years (Figure 3).

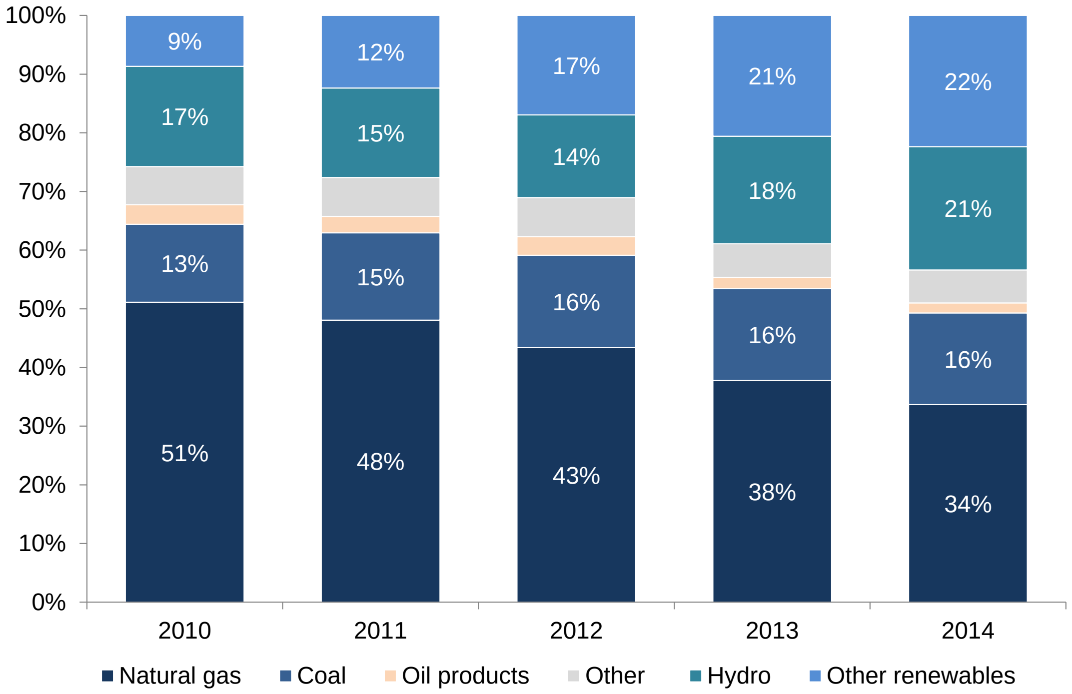
The gas demand from electricity generation represent about the 29% of national consumption (as shown in figure 1).

Natural gas is the first source of primary energy for electricity generation, with the thermoelectric sector showing the highest consumption, immediately after the residential sector. There is in fact a strong co-dependency between the electricity and the gas sector. It is therefore necessary to consider the interactions between the two markets for the assessment of risks originating on the electricity market but impacting the gas one. The interaction must also be examined for the preparation of possible measures to reduce demand in the Emergency Action Plans.

In particular, in case of a gas availability crisis requiring the reduction of daily demand, thermal generation plants may be required to contribute to the reduction of consumption to allow the continuous supply of protected customers.

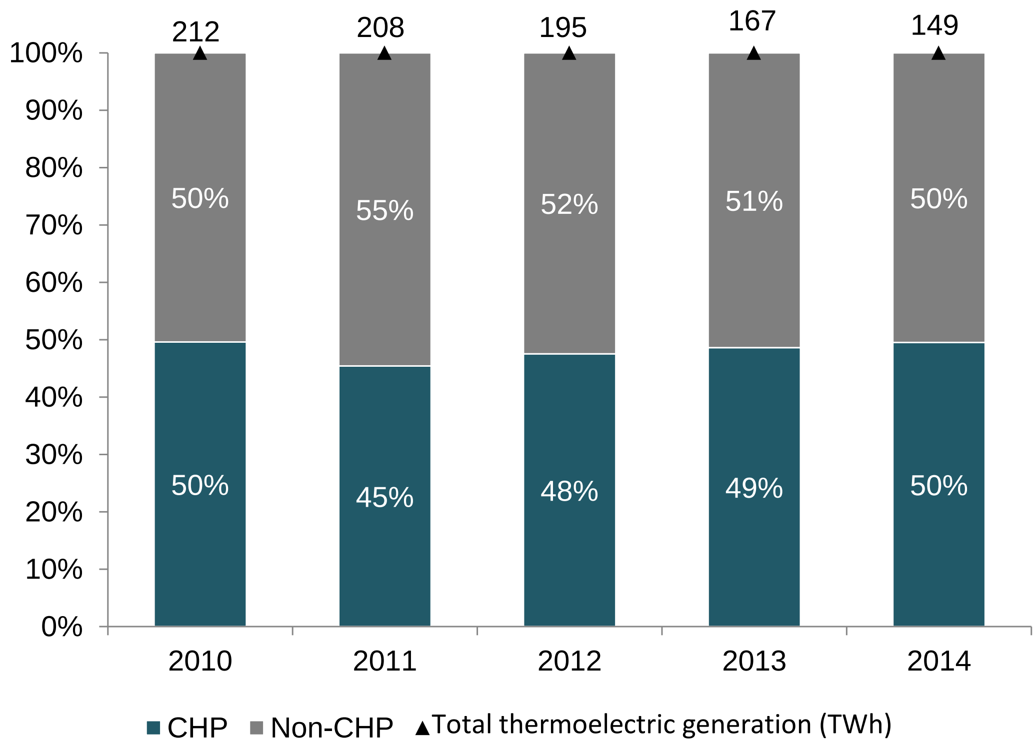
The total thermoelectric generation (sum of generation supplied with natural gas, carbon, oil product and other) can furthermore be divided into Combined Heat and Power generation (CHP) and not-CHP. As shown in the following figure the weight of the percentage of the two technologies, despite the overall reduction of the thermoelectric generation, slightly changed during the period of analysis.

Figure 3 – Electricity generation mix in Italy (2010-2014)



Source: Elaborations on Terna statistic data

Figure 4 – Thermoelectric CHP and not-CHP generation



Source: Elaboration on Terna Statistic Data

4. RISK ASSESSMENT SYNTESIS

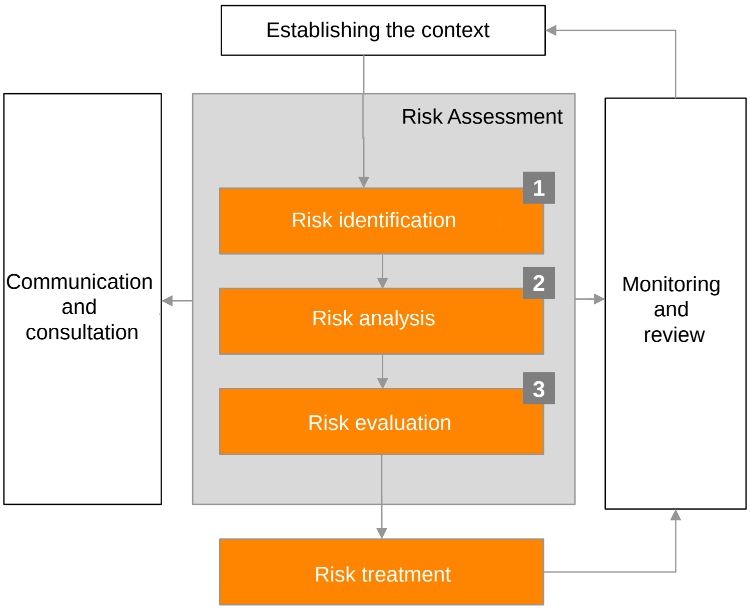
3.1. Methodology

For the risk assessment of the Italian gas system the adopted methodology consists of three main steps, according to criteria based on international standards:

- risk identification;
- risk analysis;
- risk evaluation.

The following figure represents the ISO 31000 logical scheme for risk assessment

Figure 5 – Risk assessment framework according to ISO



Source: ISO 31000

Risk assessment is part of a broader scheme concerning the whole management of risks that affect the safety of the gas system, and that includes the analysis of the context, monitoring, communication to stakeholders and the identification of mitigation measures and risk management.

3.2. Risk identification and analysis

All possible sources of danger for Italian System supply of gas have been identified and split into the four different macro-categories defined in this analysis:

- technical (T);
- political (P);
- economic (E);
- natural event (N).

Within the different sources of risk, specific risks have been identified and grouped into major risk categories. In the table below are detailed all 81 identified risks grouped by main category and source. 80 risks are coded rather than 81 because the risks related to Targeted Attacks are treated separately.

The risks were identified also with the analysis of historical records of failure events.

Table 2 – List of identified risks

Macro-category	Category	Risks	Duration*	Code
Technical (T)	Infrastructural failure	Enna compression station failure	Short	T1
		Messina compression station failure	Short	T2
		Masera compression station failure	Short	T3
		Malborghetto compression station failure	Short	T4
		Poggio Renatico compression station failure	Short	T5
		Tarsia compression station failure	Short	T6
		Montesano compression station failure	Short	T7
		Melizzano compression station failure	Short	T8
		Gallese compression station failure	Short	T9
		Terranuova compression station failure	Short	T10
		Istrana compression station failure	Short	T11
		Transmed gas pipeline rupture (mechanical damage, corrosion, overpressure, etc.)	Medium	T12
		Greenstream gas pipeline rupture (mechanical damage, corrosion, overpressure, etc.)	Medium	T13
		TAG gas pipeline rupture (mechanical damage, corrosion, overpressure, etc.)	Medium	T14
		Transitgas gas pipeline rupture (mechanical damage, corrosion, overpressure, etc.)	Medium	T15
		Cavarzere LNG terminal failure	Medium	T16
		Panigaglia LNG terminal failure	Medium	T17
		Livorno LNG terminal failure	Medium	T18
		Cavarzere LNG carrier failure	Short	T19
		Livorno carrier failure	Short	T20
		Panigaglia carrier failure	Short	T21
		Failures to extract gas from main gas field (Falconara)	Medium	T22
		Reduction of biomethane flow due to regional-wide plant failures	Short	T23

Macro-category	Category	Risks	Duration*	Code
		Settala gas storage site failure	Seasonal	T24
		Brugherio gas storage site failure	Seasonal	T25
		Sergnano gas storage site failure	Seasonal	T26
		Ripalta gas storage site failure	Seasonal	T27
		Cortemaggiore gas site storage failure	Seasonal	T28
		Minerbio gas storage site failure	Seasonal	T29
		Sabbioncello gas storage site failure	Seasonal	T30
		Fiume Treste gas storage site failure	Seasonal	T31
	Gas quality	Flow reduction from Transmed pipeline due to non-compliance of gas quality	Short	T32
		Flow reduction from Greenstream pipeline due to non-compliance of gas quality	Short	T33
	Communication and ICT control infrastructure collapse	Failure of dispatching center ICT	Short	T34
		Failure of other ICT over the network (SCADA)	Short	T35
		Failure of commercial system (e.g. PSV)	Short	T36
	Electrical blackout	Chain effect of blackout on electrical gas compression stations	Short	T37
Political (P)	Civil unrest / War / Strikes in a supplier country	Unrest in Libya	Seasonal	P38
		Unrest in Algeria	Seasonal	P39
		Unrest in Norway	Seasonal	P40
		Unrest in The Netherlands	Seasonal	P41
		Unrest in Russia	Seasonal	P42
	Strike	Strike in Italy involving Snam Group staff[6]	Short	P43
	Civil unrest / War / Strikes in a transit country	Unrest in Tunisia	Seasonal	P44
		Unrest in Austria	Seasonal	P45
		Unrest in Slovakia	Seasonal	P46
		Unrest in Ukraine	Seasonal	P47
		Unrest in Germany	Seasonal	P48
		Unrest in Switzerland	Seasonal	P49
		Unrest in The Netherlands	Seasonal	P50
		Unrest in Belgium	Seasonal	P51

[6] Only Snam staff is taken into consideration.

Macro-category	Category	Risks	Duration*	Code
		Unrest in Tunisia	Seasonal	P52
	Targeted attacks7	Targeted attacks/sabotage against the gas system infrastructure	-	-
		Attacks to ICT systems (cyber-crime)	Short	P53
Economic (E)	Gas price volatility	Diversion of LNG towards more profitable markets	Seasonal	E54
	Trade dispute	Dispute with suppliers in Algeria	Medium	E55
		Dispute with suppliers in Norway	Medium	E56
		Dispute with suppliers in the Netherlands	Medium	E57
		Dispute with suppliers in Qatar	Medium	E58
		Dispute with suppliers in Russia	Medium	E59
	Market instability	Failure of GME	Short	E60
Natural events (N)	Natural disaster	Earthquake	Seasonal	N61
		Flooding in the area of Tarvisio	Seasonal	N62
		Flooding in the area of the Gries Pass	Seasonal	N63
		Flooding in the import infrastructure area from Southern Italy	Seasonal	N64
		Landslide in Tarvisio	Seasonal	N65
		Landslide in Gries Pass	Seasonal	N66
		Landslide in the import infrastructure area from Southern Italy	Seasonal	N67
		Storm and thunder damage on Settala storage site	Short	N68
		Storm and thunder damage on Brugherio storage site	Short	N69
		Storm and thunder damage on Sergnano storage site	Short	N70
		Storm and thunder damage on Ripalta storage site	Short	N71
		Storm and thunder damage on Cortemaggiore storage site	Short	N72
		Storm and thunder damage on Minerbio storage site	Short	N73
		Storm and thunder damage on Sabbioncello storage site	Short	N74
		Storm and thunder damage on River Treste storage site	Short	N75
		Flood at dispatch and control center	Medium	N76
	Exceptional weather conditions	Extreme cold and ice	Short	N77
		Extreme heat	Short	N78

[7] These risks were not subject to quantitative assessments since Snam Rete Gas is providing the required mitigation measures internally and these are therefore not shown in the risk matrix.

Macro-category	Category	Risks	Duration*	Code
		Extreme snow and low solar irradiation	Short	N79
	Pandemic	Infectious disease affecting Snam personnel [8]	Medium	N80

* Short = 7 days, Medium = one month, Seasonal = October-March period

Each risk has been assigned an impact in terms of gas supply capacity. This impact was assessed over three different time horizons, or "periods":

- short term (7 days). Some risks are considered as temporary shocks (e.g. natural events like sudden storms and lightning) or with a limited impact duration (e.g. electrical blackout, ICT system failure, etc.);
- medium duration period (1 month). Other risks have longer impact durations up to one month. For example, this includes commercial disputes or delivery blockage in supplier countries during periods of political unrest;
- seasonal period (whole winter from October to March). Risks with a seasonal impact, are those risks that when occurring would require a longer time (longer than a month) to be addressed and resolved.

3.2.1. Cyber Crime

Part of the risk assessment is dedicated to the event that are consequences of Cyber Crime, informatics risk that affect strategic infrastructure, including national gas infrastructure (e.g. pipelines, compressions stations, storage, LNG terminals).

The risks deriving from cyber-crime are heterogeneous and might potentially threaten data confidentiality and data integrity / availability. It is possible to focus the analysis on the consequences of cyber-crime on security of gas supply. The risk to IT infrastructure, e.g. virus / malware with a wide range of damaging impacts and risks specifically relating to ICS-SCADA systems used to monitor and remote-operate gas infrastructure belong to this category.

The Snam Group's approach to an adequate management of risks deriving from the cyber-crime includes both preventive and reactive actions like:

- adoption of proven risk management methodologies for the security of asset management;
- stipulation of agreements with other institutional actors[9] for the mutual exchange of information;
- evaluation and adoption of certifications for different operating domains;
- implementation of system for the technological redundancy of information flows (see also the section dedicated to Business Continuity).

Thanks to the above mentioned security measures and to the continuous monitoring carried out by the Dispatching Centre, the potential consequences deriving from cyber-attacks can be solved through redundancy and alternative procedures. Such description of cyber-crime is supported by Snam Group's track record. Therefore, the impact deriving from such threats can be considered low in terms of security of supply at national level.

[8] Only Snam staff is taken into consideration.
[9] For example the *Computer Emergency Response Team* (CERT) Nazionale, the CNAIPIC ("Centro Nazionale Anticrimine informatico per la Protezione delle Infrastrutture Critiche") and the DIS ("Dipartimento delle Informazioni per la Sicurezza").

3.2.2. Gas quality and security

Natural gas quality, related to the composition of the gas injected into the network, varies depending on its sources (e.g. pipelines from exporting countries, domestic production, LNG terminals, etc.) and affects the composition of the gas transported and delivered, this being a mix resulting from the combination of the different gas sources injected into the transportation network.

In case out of specification gas is injected into the network, the transportation company shall intercept it except in cases where it is possible to make the gas compatible with the expected quality through appropriate mixing.

The transportation network is equipped with systems for measuring gas quality, with measurements for each entry point, continuous (with gas chromatography) and discontinuous (with samples and laboratory analysis), depending on the parameters to be measured and the capacity of the entry point. For the delivery points, measures of the GCV[10] are performed continuously for each one of the more than 230 gas Quality Areas.

The risk of service reduction, as a consequence of gas quality issues, can be considered as marginal. However, some cases aimed at understanding the possible occurrence of similar events have been identified in the detailed risks analysis illustrated in the Risk Assessment.

3.3. Crisis scenario identification

The risks identified in the first part of the assessment are combined in crisis scenarios for assessing the resilience of the Italian gas system in case of several risks occurring simultaneously.

Below are reported the results of the carried out analysis.

Three scenarios have been defined, each one built on a different macro risk category (political, economic, natural events). Technical risks are considered in the scenario that includes natural risks. Figure 6 summarizes the scenarios.

Figure 6 – Crisis scenarios details

Scenario	Description	Risks considered	Duration	Likelihood
SC1 Geo-political crisis	• High political instability • Economical stress (price volatility and instability)	• Unrest in Lybia and Algeria, Greenstream e Transmed capacity down to zero • Diversion of LNG towards more profitable markets due to high price volatility	Seasonal	1 in 20 years
SC2 Extreme natural events	• Natural disaster on an import infrastructure • Technical failure on storage field • Extreme weather conditions	• Landslide affecting Tarvisio (TAG capacity down to zero) • Technical failure on main storage field (Fiume T. capacity down to zero) • Exceptional snowfall, PV generation down to 0	Seasonal	1 in 50 years
SC3 Economic-commercial stress	• Commercial dispute • Economical stress (price volatility and instability)	• Commercial dispute with Russia (TAG capacity down to zero) • Diversion of LNG towards more profitable markets due to high price volatility	Medium	1 in 50 years

Source: Snam Rete Gas

I. The first crisis scenario (SC1) is a geo-political crisis scenario that considers the risk of new protests in North African Countries, i.e. Algeria and Libya, from which Italy imports natural gas. The most significant resulting impact is the complete interruption of imports through Greenstream and Transmed pipelines. Within this scenario we also considered economic risk, i.e. diversion of LNG ships to countries with higher prices, due

[10] Gross Calorific Value.

to price instability and volatility, resulting from a tense geopolitical situation. This risk leads to the loss of the volume corresponding to the regasification capacity of Italian LNG terminals not subject to long-term agreements, i.e. the spot capacity.

II. The second crisis scenario (SC2) considers the simultaneous occurrence of risks due to natural catastrophes. Specifically, we consider the TAG pipeline capacity at zero caused by the occurrence of a landslide. In addition we also consider the occurrence of exceptional snowfall in the North of the country with subsequent null generation capacity from distributed photovoltaic production. If this event occurs, there is a need to compensate for lack of photovoltaic production by resorting to gas-fired power generation. It has been assumed in a conservative manner that the whole photovoltaic production shortage will be replaced by gas fired power plants. This causes an increase in gas demand and a further reduction of the supply/demand balance for impact assessment. Finally, within this scenario, we also considered the technical failure at the main storage site, i.e. Fiume Treste, with subsequent null withdrawal capacity.

III. SC3 is a crisis scenario which considers economic-commercial distress. This scenario assumes that the flow through the TAG pipeline is interrupted because of a commercial dispute between Russia and Ukraine (like the one that occurred in 2009) with consequent interruption of gas supplies of Russian gas to Italy. In addition, we consider the risk of high LNG price volatility and instability leading to a diversion of LNG carriers originally directed to Italian terminals not bound by long-term agreements.

A qualitative occurrence probability has been assigned to crisis scenarios based on the likelihood of the individual risks that compose them. In the scenarios, it is assumed that the different risks considered occur together and that they are not theoretically correlated (with the exception of the geo-political risk in Libya and Algeria). This reduces the overall probability of occurrence of the scenario.

In order to include this in the total probability calculation for the scenarios, we decided to set an occurrence probability level lower than the lowest of the individual risks that compose it.

This means that all the simulated crisis scenarios were assigned a very low probability of occurrence (level 1 of 5) with the exception of the SC1 Geo-political crisis scenario which was assigned a low level of probability (level 2 of 5). The greater probability assigned to this scenario is due to the fact that this is the only scenario assumed to have correlated risks. The probability of simultaneous occurrence of two correlated risks is greater than the probability of occurrence of two completely uncorrelated risks.

This methodology allows to consider the probability of occurrence of simultaneous individual risks and the non-correlation between different category risks, even if the probability assessment is based on a qualitative scale.

3.4. Impact assessment

The identified risks have been combined to define different scenarios in order to assess the ability of the system to meet peak gas demand with risk event simultaneity, over different time horizons.

The impact was quantified considering the commercial storage capacity both for the month of January and February. For the month of February, this analysis assumes the reduction of withdrawal capacity from storage due to the progressive decline with the increase of withdrawn volumes.

The duration of crisis scenarios has been set equal to the duration of the scenario with the greatest impact in terms of supply reduction, consistent with the duration of the individual risks included.

The risk impact was quantified using a 5 level rating scale based on different values of the gas supply and demand ratio. The five impact levels are defined as:

- negligible; supply exceeds demand, based on an average gas pipeline load factor in excess of 65%, the historical average LNG terminal load factor described above, and complete availability of contractual storage capacity;

- significant; supply exceeds demand, based on an average gas pipeline load factor below 65%[11], the historical average LNG terminal load factor described above, and complete availability of contractual storage capacity;
- severe; demand exceeds supply and it is necessary to activate non-market based interruptibility, and the "dual fuel" oil capacity to reduce gas consumption for electricity production;
- relevant; demand exceeds supply and the activation of interruptible contracts and "dual fuel" oil power stations is not sufficient; part of the gas demand for power generation and industry may not be satisfied;
- catastrophic; demand exceeds supply and part of the protected customer demand cannot be met.

3.5. Risk evaluation

The last step of the ISO 31000 risk assessment framework is the risk evaluation, which aims at showing the results of the previous risk analysis steps as effectively as possible, to identify priorities for action and provide the right input to the risk treatment phase.

3.5.1. Presentation of crisis scenarios and individual risks in the probability/impact matrix

Figure 7 represents the risk matrix of all individual risks and crisis scenarios.

The majority of the individual risks are located in the low probability (level 2) and negligible impact (level 1) quadrant and in the low probability (level 2) and significant impact (level 2) quadrant.

All crisis scenarios have a very low probability of occurrence (level 1), with the exception of SC1 which has a level 2 probability (due to the correlation of the risks for supply from Libya and Algeria).

As for the level of impacts, the crisis scenarios SC1 and SC3 are located in the Relevant Impact (level 4) quadrant, while the SC2 scenario is located in the Significant Impact (level 2) quadrant.

[11] DM 6 February 2015.

Figure 7 –Probability/impact risk matrix in the month of January

PROBABILITY							
	Very high (5)	every year		P38			
	High (4)	1 in 3 years		E54		P47	
	Medium (3)	1 in 10 years			P44		
	Low (2)	1 in 20 years	T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T19 T20 T21 T33 P53 N68 N69 N70 N71 N72 N73 N74 N75 N79	T24 T25 T26 T27 T28 T29 T30 T31 N61 N62 N63 N64 N65 N66	T32 P39	P42 SC1	
	Very Low (1)	1 in 50 years	T14 T16 T17 T18 T22 T23 E58 N76	T15 P40 P41 P48 P49 P50 P51 P52 E56 E57 SC2	E55	P45 P46 E59 SC3	
			Negligible (1)	Significant (2)	Severe (3)	Relevant (4)	Catastrofic (5)
			IMPACT				

The individual risks with the greater impact are:

- unrest in Libya (P38): this risk, even though it has an impact not higher than the most part of risks mapped (interruption of imports from Greenstream), is critical given the current context of civil war in Libya, making it very high probability of occurrence of the impact;
- unrest in Ukraine (P47): this risk is characterized by a high impact (disruption of imports from the TAG pipeline), and has a high probability of occurrence given the current state of instability that characterizes diplomatic relations existing between Russia and Ukraine;
- unrest in Russia (P42), unrest in Austria (P45) and unrest in Slovakia (P46), resulting in disruption of imports from the TAG pipeline. These risks are distinguished from that resulting from the unrest in Ukraine (P47) in light of a lower probability of occurrence (respectively Low and Very Low);
- commercial dispute with Russia (E59), resulting in disruption of imports from the TAG pipeline. This risk, while causing a high impact in terms of gas supply reduction, is characterized by a very low probability of occurrence.

Among the Technical risks, only the flow reduction from Transmed pipeline due to non-compliance of gas quality (T32) is placed in the quadrant of the relevant impact, confirming the resilience of the Italian gas system.

Most risks are located in the column corresponding to significant impact, i.e. corresponding to a pipeline load factor of 65% and maximum utilization of the contractual storage capacity.

3.5.2. Sensitivity analysis on the probability/impact matrix

The matrix with crisis scenarios and individual risks is the starting point for identifying the scenarios and/or the individual risks above the attention threshold that deserve a more in-depth analysis.

It was considered appropriate to focus on risks and scenarios with a probability of at least level 2 - Low (with a frequency of occurrence of once every 20 years or greater) and with impacts on natural gas supply not less than level 3 - Severe, corresponding to a reduction of supply below the total demand.

These risks and scenarios are highlighted in the matrix in figure 8, and correspond to the 12 quadrants on the top right of the matrix.

The risks characterized instead by a very low probability level or with level 1 (negligible) or 2 (significant) impacts are considered not important, although they have been analysed in this chapter. Furthermore, the risks and scenarios with a probability of occurrence of once every 50 years are not considered important for the purpose of the design of the gas system.

Figure 8 – Matrix focus area (probability greater than 1 and impact greater than 2)

PROBABILITY		Negligible (1)	Significant (2)	Severe (3)	Relevant (4)	Catastrofic (5)
Very high (5)	every year		P38			
High (4)	1 in 3 years		E54		P47	
Medium (3)	1 in 10 years			P44		
Low (2)	1 in 20 years	T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T19 T20 T21 T33 P53 N68 N69 N70 N71 N72 N73 N74 N75 N79	T24 T25 T26 T27 T28 T29 T30 T31 N61 N62 N63 N64 N65 N66	T32 P39	P42 SC1	
Very Low (1)	1 in 50 years	T14 T16 T17 T18 T22 T23 E58 N76	T15 P40 P41 P48 P49 P50 P51 P52 E56 E57 SC2	E55	P45 P46 E59 SC3	
		IMPACT				

Source: Snam Rete Gas

In the light of this analysis, only five risks and one crisis scenario remain in the matrix focus area identified:

- flow reduction from Transmed pipeline due to non-compliance of gas quality (T32);
- unrest in Algeria (P39) and unrest in Tunisia (P44), resulting in disruption of imports from the Transmed gas pipeline;
- unrest in Russia (P42) and unrest in Ukraine (P47), resulting in disruption of imports from the TAG gas pipeline;
- geo-political stress scenario (SC1), which has a greater probability of occurrence than the other scenarios because of the correlation of the risks included. This scenario assumes a complete interruption of gas supplies from Algeria and Libya (no flows through the Transmed and Greenstream pipelines respectively) and a diversion of LNG ships destined to Italy, to other more attractive markets, with consequent loss of spot capacity at LNG terminals. This crisis situation has an estimated duration of 7 days and is deemed to have a level 2 probability of occurrence.

To assess the ability of the Italian gas system to deal with the potential risks in the identified focus area, both supply side and demand side measures are available, which can be activated to increase supply capacity or reduce demand, in critical situations.

The measures are exemplified in Annexes II and III of SoS Regulation, divided into market and non-market measures and demand and supply side measures.

Supply side measures

- Increasing imports, by using the flexibility of import contracts or by resorting to spot contracts;
- Using peak shaving capacity at the LNG regasification terminals;
- Complete utilization of contracted transport capacity and of contracted "slot" in LNG regasification terminals;
- Increasing withdrawal from storage.

Demand side measures

- Reducing gas demand resulting from interruptible commercial contracts;
- Using alternative fuels in industrial plants, on the basis of specific existing agreements in supply contracts;
- Resorting to power plants fired with fuel oil and fuels other than gas, based on commercial agreements and on indications from Terna (the Italian electricity TSO) with consequent reduction of gas demand;
- Restriction of the use of gas for power plants that are not necessary for the balance of the Italian electricity grid;
- Mandatory reduction of gas deliveries to industrial customers;
- Reduction of gas consumption by domestic customers with definition of new temperature and/or time thresholds, for heating.

The following paragraphs show the results of the risk matrix analysis with the maximization of the supply side measures.

Figure 9 displays the risk matrix following the sensitivity analysis with:

- increase of gas injections through the activation of the peak shaving capacity at regasification terminals (equivalent to 109 Mcm);
- increase of import flows at maximum historical levels of utilization.

Figure 9 – Risk matrix with activation of peak shaving capacity and maximization of commercial imports

PROBABILITY		Negligible (1)	Significant (2)	Severe (3)	Relevant (4)	Catastrofic (5)
Very high (5)	every year	P38				
High (4)	1 in 3 years	E54			P47	
Medium (3)	1 in 10 years		P44			
Low (2)	1 in 20 years	T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T19 T20 T21 T24 T25 T26 T27 T28 T29 T30 T31 T33 P53 N62 N64 N65 N68 N69 N70 N71 N72 N73 N74 N75 N79	T32 P39 N61 N63 N66		P42 SC1	
Very Low (1)	1 in 50 years	T14 T16 T17 T18 T22 T23 P40 P41 P48 P50 P51 P52 E58 N76	T15 P49 E55 E56 E57 SC2		P45 P46 E59 SC3	
		IMPACT				

Source: Snam Rete Gas

The increase in imports and the use of peak shaving allow for a reduction of the impact of most of risks and crisis scenarios of the matrix (Impact higher than 3 and probability of occurrence higher than 1). The only risks to remain in the matrix focus area are:

- geo-political stress scenario (SC1);
- unrest in Russia (P42) and unrest in Ukraine (P47);

The SC1 scenario remains within the matrix focus area because, unlike the other crisis scenarios, is characterized by a higher probability of occurrence (Lower - level 2) due to the correlation between the individual risks that compose it. Risks P42 and P47 positioning remain unchanged since their maximum impact determined on the gas system is on the short-term (7 days), and therefore do not benefit from further increases in the utilization rate the pipelines. This rate is in fact expressed in this sensitivity analysis as realignment to the observed maximum rate, coinciding with the short-term rate.

The sensitivity analysis shows that, thanks to peak shaving and increase in imports, a partial reduction of the risks that are placed above the significant impact occurs, with impacts on demand and probability of occurrence exceeding 1.

Figure 10 displays the probability/impact matrix following the second sensitivity analysis, which includes:

- the maximization of storage withdrawal capacity;
- the obligation of complete utilization of contracted transport capacity (load factor equal to 98%).

Figure 10 – Matrix of risks with increase in withdrawal capacity from storage and import imposed maximization

PROBABILITY	Very high (5)	every year	P38				
	High (4)	1 in 3 years	E54	P47			
	Medium (3)	1 in 10 years	P44				
	Low (2)	1 in 20 years	T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T19 T20 T21 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 P53 P39 N61 N62 N63 N64 N65 N66 N68 N69 N70 N71 N72 N73 N74 N75 N79	P42 SC1			
	Very Low (1)	1 in 50 years	T14 T15 T16 T17 T18 T22 T23 P40 P41 P48 P49 P50 P51 P52 E55 E56 E57 E58 N76 SC2	P45 P46 E59 SC3			
			Negligible (1)	Significant (2)	Severe (3)	Relevant (4)	Catastrofic (5)
			IMPACT				

Source: Snam Rete Gas

After the sensitivity analysis all the identified risks and crisis scenarios are mapped in the area of Negligible and Significant impact levels (levels 1 and 2), therefore with a natural gas supply that stays well above demand, with a reasonable security margin.

With the activation of the measures for increasing imports and maximization of the withdrawal from storage, no risk or crisis scenario has an impact on the gas demand of the power generation segment (level 4 - Relevant), thereby excluding any knock-on effect of the electrical system (e.g. potential blackout with resulting effects on gas system).

This analysis shows the solidity and the resilience of the Italian gas system to cope with both identified risks and considered crisis scenarios.

Please note that, from a methodological and results perspective, any increase of the storage capacity with respect to contractual levels used in the calculation must be evaluated on a case by case basis with details of the period, conditions, etc.

5. INFRASTRUCTURE STANDARD

4.1. The N-1 indicator

Article 6 of the SoS Regulation provides that by December 3, 2014, in the event of a disruption of the single largest gas infrastructure, the capacity of the remaining infrastructure, determined according to the N-1 formula (see below), is able to satisfy total gas demand during a day of exceptionally high gas demand occurring with a statistical probability of once in 20 years.

Annex 0 of the Regulation gives the algorithm to calculate the N-1 formula that, with demand side market-based measures, is expressed as follows:

$$N-1[\%] = \frac{EP_m + P_m + S_m + LNG_m - I_m}{D_{\max} - D_{eff}} \times 100, N-1 \geq 100\%$$

The terms of the formula have been calculated as follows:

EP_m	Import capacity available in the time period considered. This includes the interruptible capacity that is technically available when the demand Dmax occurs.
P_m	Maximum technical production capacity. This is the sum of the maximum technical capacities of the daily production of all the gas production facilities at the entry points of the national network. It was evaluated by considering the forecasts for annual production and divided by 355 days (355 and not 365 days are considered according to a standard industry approach).
S_m	Maximum technical deliverability of storage defined as the sum of the maximum daily withdrawal capacity of all the storage facilities that can be delivered to the entry points of the national network, taking into account their respective physical characteristics. The maximum capacity used in the calculation is the monthly average for January, assuming that there are no un-availabilities and that the withdrawal in the previous months is in line with the contractual commitments.
LNG_m	Maximum technical capacity of the LNG plants, i.e., the maximum send-out capacity of the facilities, taking into account the critical elements like unloading, ancillary services, temporary storage and regasification of LNG.
I_m	Maximum capacity of the major entry point of the national network, which is the entry point of Tarvisio.

D_{max}	The demand of the entire Italian gas market, determined by considering the forecast of market consumption not weather-related and that weather-related, in exceptional weather conditions evaluated with the probability of occurrence of 5% (once every 20 years, ref. Annex A2).
D_{eff}	The portion of the demand that, in case the supply is interrupted, can be adequately and promptly covered using market-based demand measures. This value is set equal to 0 as the auctions for the allocation of interruptible demand on a voluntary basis have been replaced by other measures (e.g. peak shaving).

The formula is evaluated with the values expected for the thermal years 2015/16 and 2018/19. It was considered appropriate to evaluate the formula in 2018/19 to have a prospective view that includes the following changes compared to the current values:

- envisaged increase of D_{max};
- envisaged increase of the national production;
- increase of the maximum technical storage withdrawal, following the achievement of full operations in Bordolano.

The introduction of bidirectional capacity does not change the results of the N-1 formula calculation as, based on the SoS Regulation, only the technical import capacity should be considered, even at the network points where reverse capacity has been developed. The export capacity does not reduce the import capacity for the purpose of calculating the N-1 formula.

The values used for the calculation and the results are reported in Table 3.

In 2015/2016 the formula assumes a value of 105.5% indicating a sufficient level of margin in the gas system. In 2018-19 the value rises to 107.5% thanks to the increase of storage capacity and to national production, which more than compensate for the increase in daily demand.

Table 3 – The N-1 indicator

	Valuation 2015	
[Mcm/d]	**2015-2016**	**2018-2019**
D_{max}	**446.3**	**455.1**
D_{eff}	-	-
EP_m	**326.2**	**326.2**
Mazara del Vallo	105.2	105.2
Gela	37.8	37.8
Passo Gries	64.4	64.4
Tarvisio	**114.0**	**114.0**
Gorizia	4.8	4.8
P_m	**20.0**	**28.2**

S_m	**186.0**	**196.0**
Stogit	180.0	190.0
Edison Stoccaggio	6.0	6.0
LNG	**52.8**	**52.8**
Panigaglia	11.4	11.4
Livorno	15.0	15.0
Cavarzere	26.4	26.4
I_m	**114.0**	**114.0**
N-1 [%]	**105.5%**	**107.5%**

Source: Snam

4.1.1. Internal congestion assessment in the event of interrupted flow at Tarvisio or at Mazara del Vallo

The calculation of the N-1 indicator, as previously described, provides results that indicate, for the requirements associated with this indicator, a sufficient safety margin of the Italian gas system in terms of its ability to meet demand.

To supplement the analysis about the system's capacity to deal with demand in exceptional weather conditions without imports flowing from Tarvisio, some simulations were conducted to assess whether any internal congestion can occur in specific situations.

Using its own hydraulic model, Snam Rete Gas has verified that, when the exceptionally high demand occurs and with no flows at Tarvisio, or at Mazara (as the major entry points), the system is able to supply the gas to the market while respecting the constraints of pressure and the maximum capacity of the network plants.

In the case of an interruption at Tarvisio, the following input data have been taken:

- capacity at Tarvisio and Gorizia equal to zero;
- market demand equal to the maximum that occurred in the year 2014-15, in line with the assumed maximum demand in the N-1 formula calculation;
- capacity at the other pipeline import points equal to the maximum firm capacity;
- conservatively, the capacity at the Gela point equal to half of that available to take into account the possible reductions like those that occurred during the beginning of the winter season 2015-16;
- conservatively, the capacity at the terminals of Livorno and Panigaglia equal to zero.

In this case, no congestion has been observed. The minimum pressure of 50 bar is guaranteed on the whole backbone network, the compression station of Poggio Renatico pushes the gas northward, with a degree of power utilization equal to 53% and in compliance with the pressure constraints upstream and downstream. The Istrana compression station pushes the gas eastward, with a degree of power utilization equal to 60% and in compliance with the pressure constraints upstream and downstream.

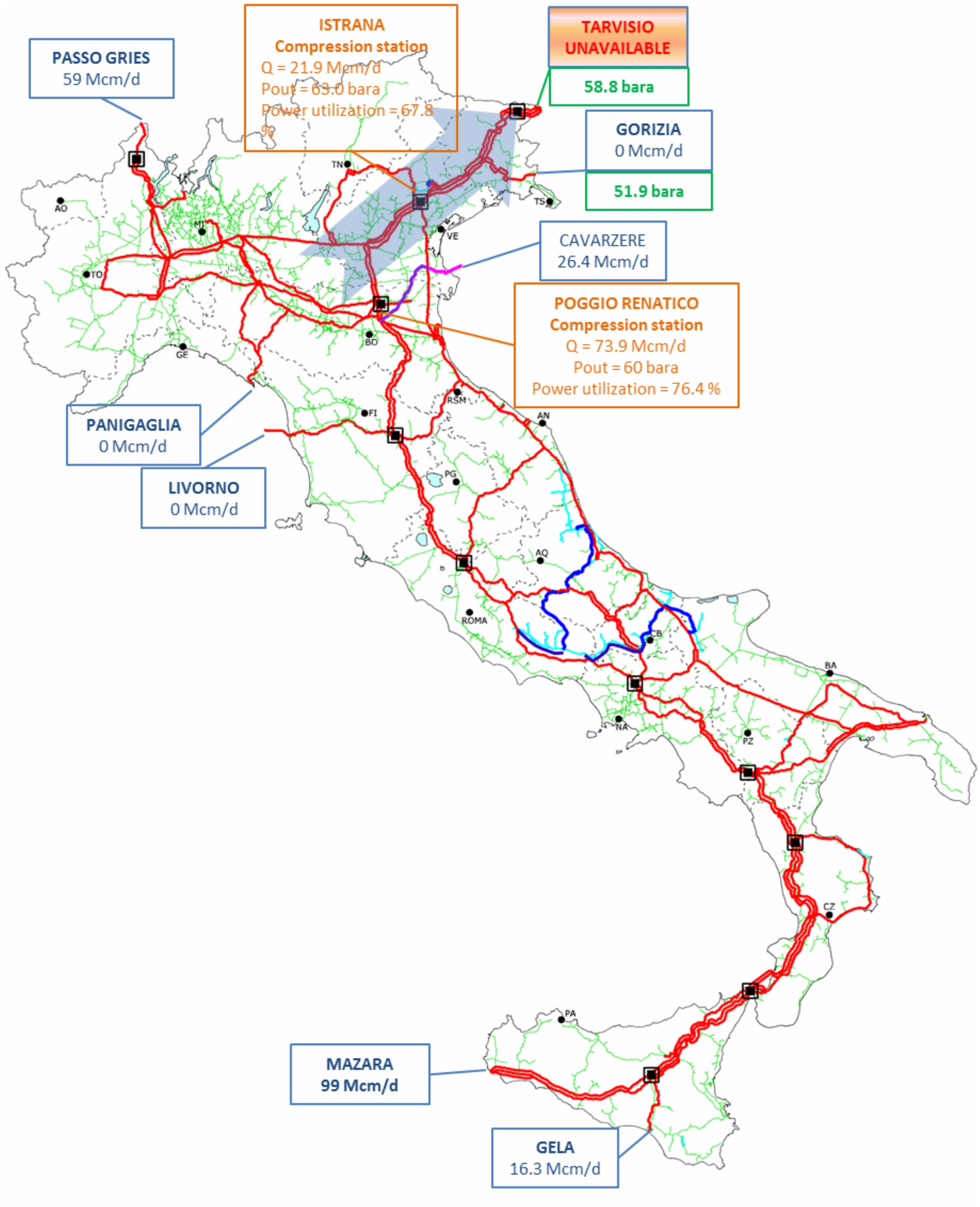
Even in the case of an interruption at the entry point of Mazara del Vallo, the simulation results confirm the system's capacity to cope with the demand. The calculation inputs are similar, only the capacity at the point of

Mazara del Vallo is set at zero while those at Tarvisio and Gorizia are set equal to the maximum capacity. In this case the minimum pressure of 50 bar is guaranteed on the whole backbone network, the compression station of Poggio Renatico and Terranova Bracciolini push the gas southward, with a degree of power utilization equal to 61% and 68%, respectively, and in compliance with the pressure constraints upstream and downstream. In this simulation, the gas from the North reaches the redelivery points of Calabria.

Figure 11 and Figure 12 provide a schematic representation of the assumptions and results of the calculation of congestions.

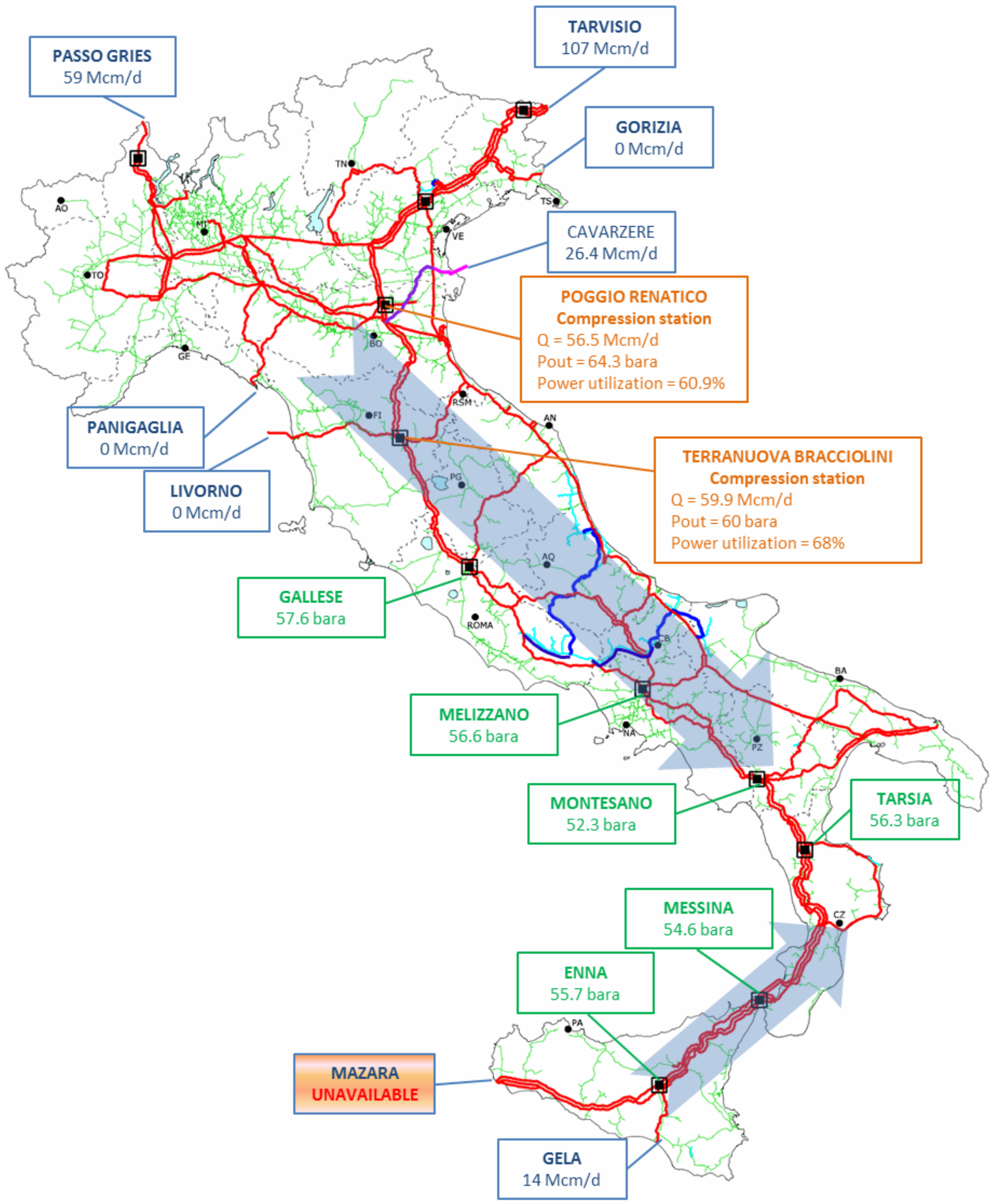
The simulation model used by Snam Rete Gas was validated by the Politecnico of Milano. The model is also used in the process for the definition of the transportation capacity, certified according to Standard UNI EN ISO 9001: 2008 by DNV.

Figure 11 – Congestion analysis results with interruption at Tarvisio



Source: Snam Rete Gas

Figure 12 – Congestion analysis results with interruption at Mazara del Vallo



Source: Snam Rete Gas

4.1.2. Analysis of bidirectional capacity

Article 6, paragraph 5, of the Regulation provides that by December 3, 2013 the transmission system operators enable a permanent bidirectional capacity on all cross-border interconnections between Member States. In particular, in compliance with paragraph 6 of the same Article, when bidirectional capacity already exists or is under construction for a specific cross-border interconnection, the obligation referenced in paragraph 5 shall be deemed to be met.

Legislative Decree 93 of 1 June 2011 also includes the interconnection with Switzerland as a point at which to develop bidirectional capacity.

To date, counter flow physical capacity is available at the following points:

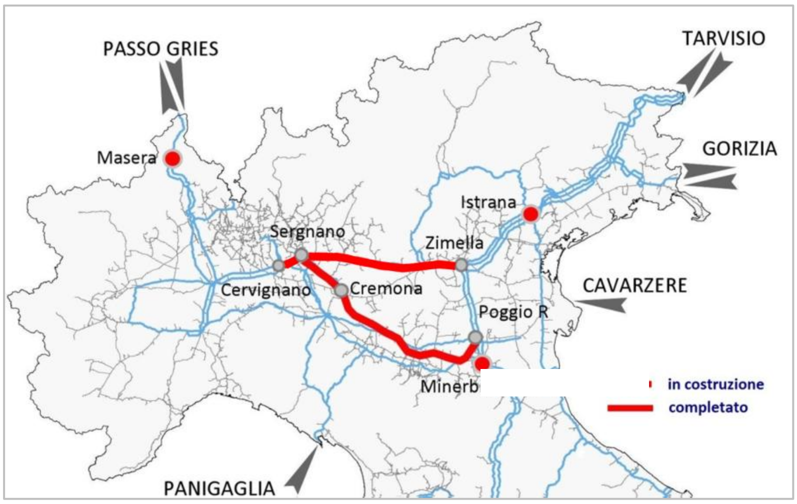
- exit point of Tarvisio, with a physical capacity of 18 Mcm/day from Italy to Austria;
- exit point of Passo Gries, with a capacity of 5 Mcm/day from Italy to Switzerland. Since October 2015 this capacity, until then available only as a "virtual" capacity, became physical after the completion of the first phase of the upgrading works aimed at increasing the flexibility and security of supply in the North Western markets;
- exit point of Gorizia, with a capacity of 4.4 Mcm/day from Italy to Slovenia, EU Member State.

The 18 Mcm/day output flow at Tarvisio is an interruptible capacity subject to the existence of a physical flow in input, or zero, at Passo Gries.

This is the main development project included in the 2015-2024 Ten-Year Plan of Snam Rete Gas for the "Support of the Northwest markets and bidirectional cross-border flows" and is mainly aimed at increasing the flexibility and security of supply in these markets. The project is also aimed at strengthening the output capacity at the interconnection point of Passo Gries.

This will in fact enable a further enhancement of export capacity up to 40 Mcm/day at Passo Gries. At Tarvisio there will be a physical flow of 18 Mcm/day. The maximum contemporary physical flow in exit from both points will be at a maximum of 40 Mcm/day.

Figure 13 – Upgrades aimed at supporting the Northwest market

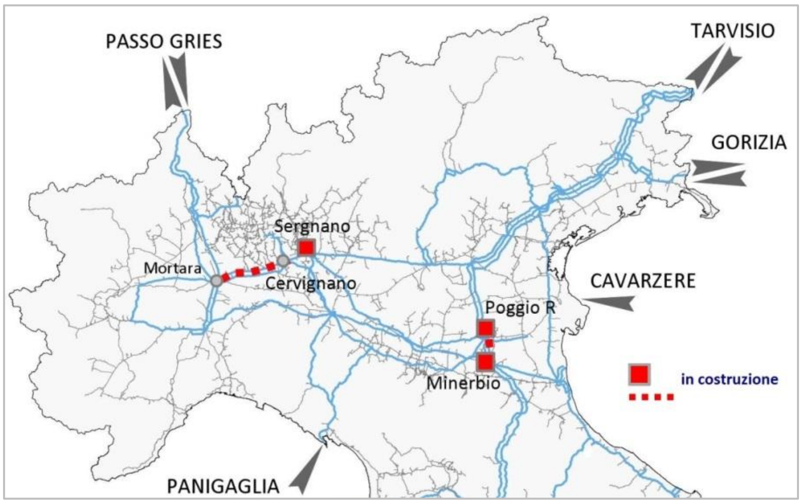


Source: Snam Rete Gas

In the second phase of the project the following enhancements will be implemented:

- realization of the pipeline Cervignano-Mortara (62 km) and Minerbio - Poggio Renatico (19 km);
- construction of the new compressor stations Minerbio (24 MW) and Sergnano (45 MW);
- upgrade of the existing compression station of Poggio Renatico (+25 MW)

Figure 14 – Enhancements aimed at supporting Northwest markets and bidirectional cross-border flows



Source: Snam Rete Gas

The network of Snam Rete Gas S.p.A. also plans to ensure a bi-directional capacity along the Transmed, an important route of gas flows from North Africa.

An only-export capacity is available towards Switzerland, at the exit point of Bizzarone.

4.1.3. System resilience indicators

In addition to what is explicitly required by the SoS Regulation, the Italian gas system has been evaluated against the resilience indicators defined by ENTSOg. This includes:

- Import Dependence Index, or IDI;
- Import Route Diversification Index, or IRDI;
- Remaining Flexibility Index, or RFI.

The Import Dependence Index measures the degree of coverage of the daily demand by storage and domestic production. The indicator characterizes the security of the supply of a gas market. The indicator assumes values between 0% and 100%, the latter case indicating the total dependence of the system on imports.

The Import Route Diversification Index is built on the logic of the Herfindahl-Hirschman Index and measures the degree of concentration of the sources and the import capacity. The indicator can range from 0 and 10,000, in this last case indicating a degree of concentration maximum. According ENTSOg there are no defined thresholds, although values in the first third of the range (0 to 3,300) are certainly indicative of a good diversification. The indicator provides information both on the security of the supplies and the degree of competitiveness of a gas market.

The Remaining Flexibility Index assesses the capacity not used on a day of maximum demand. The higher the residual capacity, the greater the flexibility for network users who can modify the programs of the gas flows. The indicator assumes values between 0% and 100%, the former case indicating the lack of flexibility, and provides an assessment primarily for the integration of markets but also for the security of supply. ENTSOg considers values below 5% as indicating critical situations. The indicator used herein considers all the incoming flows, and all the supply capacity (including LNG and storage), while the indicator defined by ENTSOg considers inflows and capacity at any pipeline interconnection point.

Table 4 –System resilience indicators

	IDI	IRDI	RFI
Value 2015/16	68%	2,181	11%
Value 2018/19	67%	2,181	13%

Source: Snam

The Import Dependence Index shows high values, as is to be expected for the Italian system where domestic production covers only a limited part of the demand. The value decreases due to the increase of storage capacity and national capacity.

Particular interesting is the result of the Import Route Diversification Index. The value of 2,181 shows a good diversification of sources and supply routes. This value remains the same also for 2018-19.

The Remaining Flexibility Index, finally, allows users of the transportation system good margins of flexibility. In this case also, the value improves in 2018/2019 due to increasing storage withdrawal capacity.

6. SUPPLY STANDARD

5.1. Definition of "protected customers" and the related demand

"Protected customers", i.e. the customers to whom supply shall be ensured in emergency situations, are defined by Article 7 of Leg. Decree 93/11 as "domestic customers, clients related to public service activities, including hospitals, nursing and rest homes, prisons, schools, and other public and private structures that carry out a recognized support activity, as well as civil and non-civil customers with consumption not exceeding 50,000 cubic meters a year."

The description stated above stems from the definition of protected customers as in the SoS Regulation, according to which that category is represented by "*all household customers connected to a gas distribution network that may include, if the Member State concerned so decides, also:*

- *small and medium enterprises, provided they are connected to a gas distribution network, and those that provide essential social services, provided they are connected to a distribution network or gas transmission network, provided that all these additional customers do not represent more than 20% of end users; and/or*
- *district heating plants that serve both household users and the users referred to the previous bullet, provided that the facilities are not convertible to other fuels and are connected to a gas distribution or transport network".*

During the consultation process for the review of Regulations SoS, some stakeholders identified the necessity to formulate a single definition at European level, which should guarantee equal treatment of the protected customers in all Member States, in an emergency situation at regional level.

Pending the consultation process, the definition here adopted remains compliant with the definition contained in Art. 7 of Legislative Decree 93/11.

For the purposes of the risk assessment of this document, demand from the "protected customers" is considered equal to that of the market interconnected to the transportation network through the delivery points on the distribution networks, calculated by Snam, netting the consumption of non-domestic customers, not related to public utility activities with an annual demand exceeding 50,000 Scm.

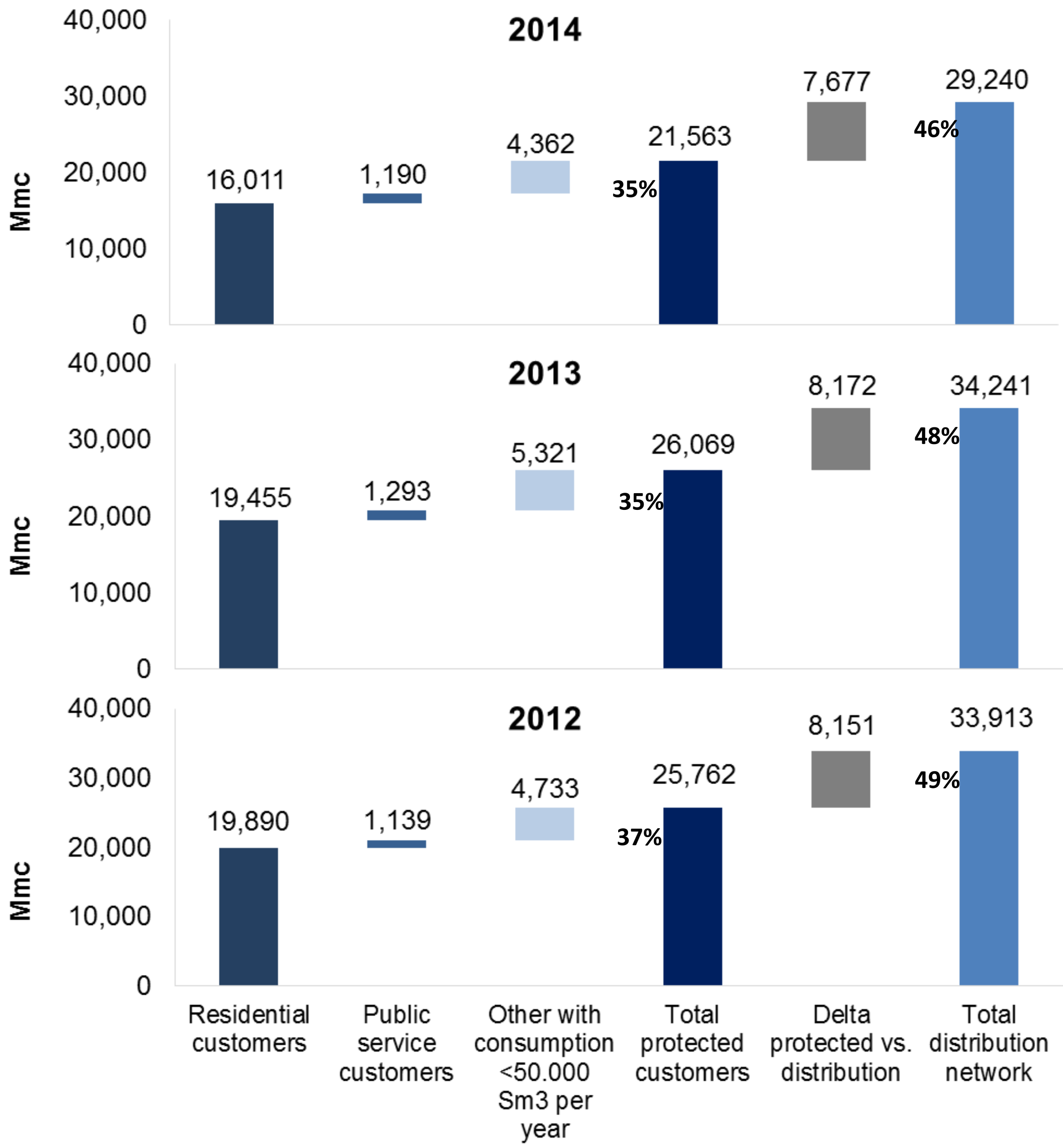
The difference between the demand of the customers connected to the distribution networks and the demand of "protected customers" calculated based on AEEGSI data (Annual Report) is approximately 8 Bcm per year in the 2013-2015 period (see Figure 15). This difference represents a significant share of total demand from distribution networks and therefore it is considered necessary to exclude it from the calculation in accordance with Art. 8 in order to avoid an excessive overestimation of demand from "protected customers".

In particular, for the calculation of the "protected customers" demand, the following methodology was adopted:

- calculation of the "protected customers" total demand as the sum of the total consumption of "Households", "Condominium households", "Public service activities" and the share of consumption for non-residential customers with a consumption lower than 50,000 Scm per year (Commerce and services, industry, power generation);
- calculation of the share of total demand from distribution networks exceeding the total demand from "protected customers" as calculated in the previous step. This value was defined as the average of the last three years (2013, 2014, 2015), and it showed a substantially constant weight (respectively 23.9%, 26.5% and 23.9%). This surplus was calculated on a daily basis (considering 365 days/year), assuming a stable daily profile not driven by thermal needs.

- netting of the quota previously calculated from the daily demand from distribution networks provided by Snam.

Figure 15 – Consumption of protected customers and the distribution networks (Mcm)



The **%** represent the percentage of total demand covered respectively by "protect customers" and distribution network.

Source: Elaboration on AEEGSI Annual Reports 2014, 2015, 2016

5.2. Guaranteed supply to protected customers

According to Article 8 of the SoS Regulation, supply shall be ensured to protected clients of the EU Member States in the following cases:

- extreme cold temperatures during a 7-day peak period occurring with a statistical probability of once in 20 years (Article 8.1a);

- any period of at least 30 days of exceptionally high gas demand, occurring with a statistical probability of once in 20 years (Article 8.1b); and
- for a period of at least 30 days in the case of the disruption of the single largest gas infrastructure under average winter conditions (Article 8.1c).

The first and the second case refer to a period of intense cold for, respectively, seven and thirty consecutive days, while the last refers to any period of thirty days in average winter conditions.

The demand for a seven-day period of intense cold and for periods of 30 days of intense cold and of average cold was calculated using a time series analysis over the period 1962-2013.

The assumptions underlying the calculation are the following:

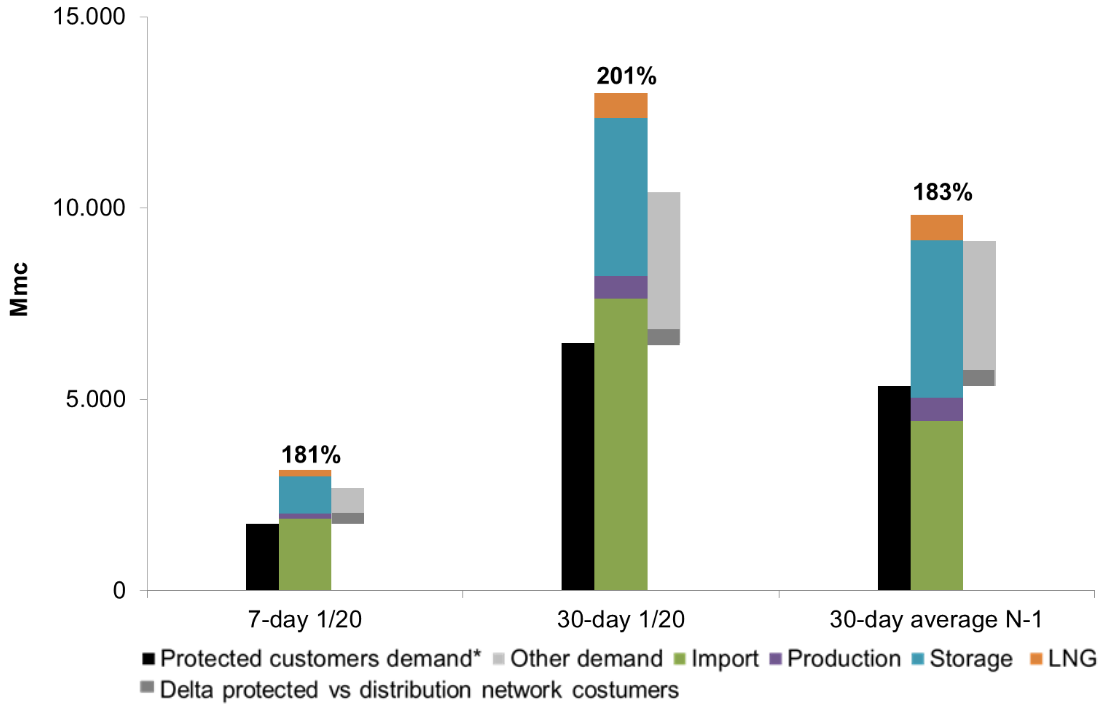
- the calculation was performed considering the demand for seven days as well as the demand for thirty days, assuming the supply conditions of January, February and March;
- the calculation considers a complete replenishment of storage sites (with 12.2 Bcm of working gas[12]);
- the calculation was also performed assuming an utilization rate[13], quantified for each pipeline over a period that includes the thermal years from 2012/2013 to 2014/2015, equal to the maximum value of the average annual utilization rates, calculated to coincide with the periods of relative peak demand;
- for the calculation of LNG terminals utilization rates, the same approach was adopted. The time period considered (from 2012/2013 to 2014/2015) allows to include in the estimation the thermal years in which there was a low-use of the Panigaglia and Livorno terminals, which, according to forecasts, should remain similar in the next years.

It was considered appropriate to calculate the utilization rates over a very recent period in order to take in due account the existing market conditions.

Figure 16 shows the demand (in black the "protected customers" demand and in grey the remaining demand) and the sources of supply for the month of January. The supply is always well above the demand of both "protected customers" and that of all customers, with percentages ranging from 181% in the case of the seven days, to 201% and 183% in the case of the thirty days, in extreme weather conditions and under normal weather conditions without import flows from Tarvisio, respectively.

[12] Stogit: 11.5 Bcm; Edison: 743 Mcm.
[13] Gas volume actually delivered in relation to the maximum capacity of gas pipelines.

Figure 16 – Coverage of protected customer demand in January



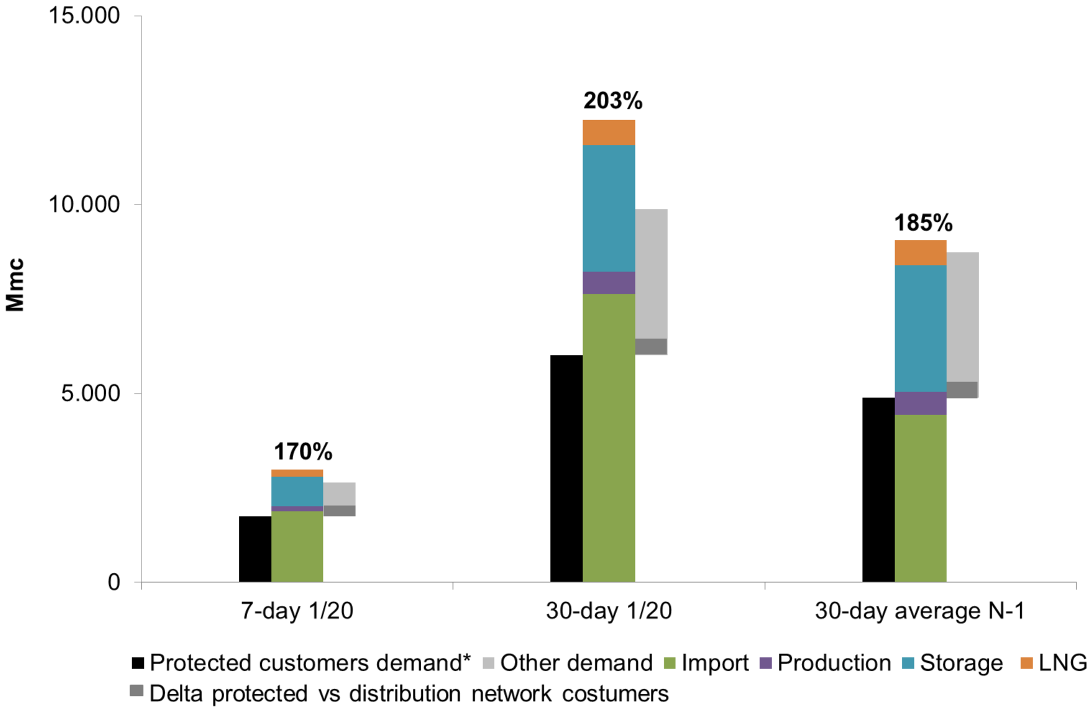
Source: Elaborations on Snam data; *Demand from distribution networks reduced by the consumption of non-residential customers and customers not related to public utility activities with an annual demand exceeding 50,000 Scm

The February and March simulations also showed positive results in terms of coverage of protected customer demand. Comparing the cases in January and February, we observe that February has less storage withdrawal capacity and a substantially comparable demand. However, the figure for February is still clearly positive (170%). In the case of the thirty days, the decrease in delivery capacity is compensated in February by lower demand of protected customers (especially in the case of extreme weather conditions), and therefore the results are just as positive as those recorded for the month of January.

The results are similar when comparing the months of February and March (Figures below). In this case the difference in the demand is still greater than the difference between the withdrawal capacities. The results for March are thus better than those for February and thus better than those for January.

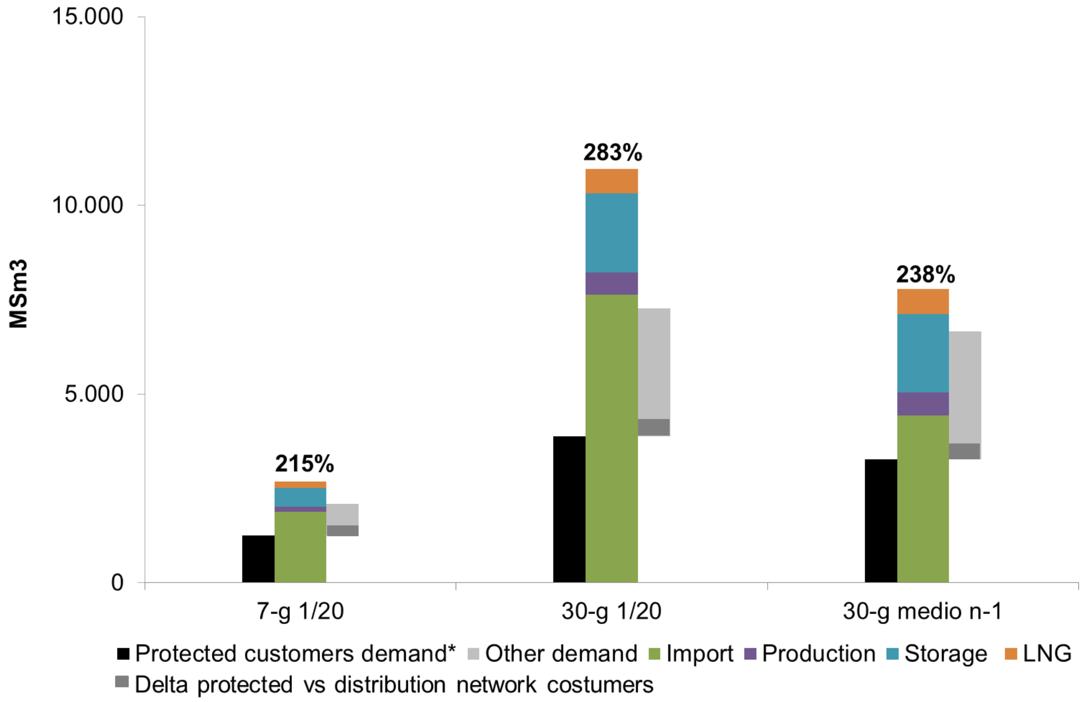
The analysis mentioned above was carried out according to the correct definition of protected customers. These analyses give positive results. Coverage rates were also calculated considering demand of the distribution network in its entirety, without netting of the consumption of non-residential customers not related to activities of public utility with annual demand exceeding 50,000 Scm. Also in this case, the supply is always well above demand. For example, for the month of January, the percentage of coverage ranging from 166% in the case of the seven days, at 183% and 164% in the case of thirty days, in extreme weather conditions and under normal climatic conditions without import flows from Tarvisio, respectively.

Figure 17 – Coverage of protected customer demand in February



Source: Elaborations on Snam data; * Demand from distribution networks reduced by the consumption of non-residential customers and customers not related to public utility activities with an annual demand exceeding 50,000 Scm

Figure 18 – Coverage of protected customer demand in March



Source: Elaborations on Snam data; * Demand from distribution networks reduced by the consumption of non-residential customers and customers not related to public utility activities with an annual demand exceeding 50,000 Scm

In conclusion, a sensitivity analysis was conducted to determine the utilization rate of gas pipelines needed to meet total demand. The results are reported in Table 5 for the month of January. In the 7-day case the minimum gas utilization rate needed to ensure coverage of the total demand is 61%. Thus the rates are in line with the average rate of gas use in the period from October to March, approximately 65%. Note that this rate is as the one set in Ministry Decree of 6 February 2015, on measures relating to security of the national gas system with reference to the storage, art. 2, paragraph 2. The minimum rate of use of the pipelines in the other two cases is lower being the demand over 30 days, especially in normal conditions, less than proportional to the number of days when compared with that of 7 days in exceptional weather conditions

Table 5 – Sensitivity to the utilization rate of gas pipelines and the coverage of protected customers demand

%	January		
	7-d 1/20	30-d 1/20	30-d n-1
Minimum utilization rate to cover total demand	61%	51%	59%

Source: Elaborations on Snam data

5.3. Legislative measures for the protection of protected customers

The calculation in compliance with Article 8 presented in the previous sections, based on a comparison between supply and demand volumes, gave positive results. However, these results do not in itself guarantee the supply to protected customers without additional effective control and protection measures of the flows toward these customers.

Flows may be controlled at the redelivery points of the distribution networks, i.e. at the points of exit from the regional transport network[14]. The possibility to intervene on flows from consumers directly connected to the transmission network, such as industrial and power generation, represents a measure to protect demand of distribution networks and consequently protected customers, and therefore the most efficient option is to intervene on the transportation network. It would be particularly difficult, considering the significant number of distribution companies, to control gas flows on final customers directly connected of the distribution networks.

There are other, regulatory measures, implemented to safeguard protected customers, i.e. customers on the distribution grid. The first measure is represented by an adequate withdrawal storage capacity during the winter period. Such capacity is aimed at preserving the possibility for the gas system to cope with the peak withdrawal due to the thermal load, typically because of the consumption needs of "protected customers". The Ministry defines each year (in February) the curve of storage withdrawal forecast, consistent with the estimates of peak demand for the following thermal year. This curve is then updated by Stogit at the beginning of the thermal year (October) on the basis of the availability of gas in storage.

Additional measures for "protected customers" are required under the Emergency Plan, aimed at protecting all customers, and not just the protected customers. The activation of the measures contained in it is provided in situations of alert/emergency typically attributed to the ability of the gas system to meet the demand of these customers. Among them the following apply:

- availability of a strategic gas storage reserve. In case of further need for working gas at the end of the season over the commercial stock, the consumers are supplied by drawing on strategic gas reserve. The volume of strategic reserve is determined by the Ministry and for the year 2015/16 it is equal to 4.6 Bcm.
- the switching fuel capacity of power generation plants;
- the use of LNG storage with peak shaving functions;
- non-market based interruptibility for industrial customers. This measure envisages special auctions for the allocation of interruptible demand[15].

The right to access to modulation capacity by operators that have sales activities and serve the civil market is no longer applicable. This was related to the obligation to provide the modulation service to clients according to Article 18 of Legislative Decree number 164 of May 23, 2000. At the same time, for the protection of customer under Art. 12, paragraph 7 of the Legislative Decree 164/00, the regulator decided to allocate most of the modulating storage capacity to a service characterized by a withdrawal profile designed to meet the needs of the customers mentioned above, and this capacity will have to be allocated through market mechanisms with priority over other services.

[14] The redelivery points on the distribution networks may also be attributable to other categories in addition to the protected customers.
[15] These auctions were not held for the thermal year 2015/2016.

7. Risk prevention and reduction measures

Considering the results of the Risk Assessment mentioned at previous par. 1 and the standard obligations in terms of infrastructures and supply, as provided for by art. 6 and 8 of the Regulation, this Plan identifies possible actions of improvement of Italian gas system combined safety, developable in short and medium term, keeping into account risk prevention and reduction measures already available, described in the Emergency Plan.

6.1. Identified risk and reduction measure

Table 6 report the risk macro-categories - technical, political, economic and natural events - that have been identified in the Risk Assessment document, split into the principal reference risk categories. The preventive measures are reported for risk managing and containment.

Table 6 – Preventive measures

Macro-category	Category	Preventive Measures
Technical (T)	*Infrastructural failure*	**Remotely Monitoring and redundancy principle** Remotely Monitoring of plants thanks to a system of supervision, control and data acquisition (SCADA) and a telemetry network with high reliability. Redundancy principle is implemented in the Design and management of the gas system (e.g. interconnection of the gas grid, spare unit in in compressor station, etc.).
	Gas quality	**Gas quality instruments tools** Out of specification gas is intercepted thanks to the equipments of the transport network such as gas quality measurement instruments with measurements for each entry point, continuous (with gas chromatography) and discontinuous (with samples and laboratory analysis), depending on the parameters to be measured and the capacity of the entry point. For the delivery points, measures of the GCV are performed continuously for each one of the more than Gas Quality Areas. All pipelines interconnected with the entry points of the Italian network, except the Greenstream, the natural gas pipeline coming from Libya, pass through other countries before reaching Italy. This means that the TSOs of these countries detect first any possible alteration of the gas quality and report the problem through appropriate cooperation agreements concluded with Snam Rete Gas. The Greenstream entry point, like the other import points, is equipped with specific instruments to measure the gas quality and in case of significant alteration, they immediately report the problem to the dispatching and control centre of Snam Rete Gas.
	Communication and ICT control infrastructure collapse	**Redundancy of communication and control ICT infrastructures** IT infrastructures supporting the natural gas system are periodically tested in order to verify the observance of the standards and to guarantee the security of systems and of information. The Dispatching control room has a backup site (with redundancy of both operator posts and servers). Snam procedures for Business Continuity management guarantee the business continuity against the occurrence of events that are serious enough to compromise the normal operation of critical processes, with the goal of ensuring a minimum service level.

Macro-category	Category	Preventive Measures
	Electrical blackout	**Gas powered compressor stations along network** A possible blackout of the power grid does not have any critical impact on the system, in fact it reduces the demand (mainly of the industrial sector which in case of blackout would have to stop production) even if it might increase the injection of excess gas into storage (not consumed by the industry).
Political **(P)**	Civil unrest / War / Strikes in a supplier country Strike Civil unrest / War / Strikes in a transit country Targeted attacks	**Intergovernmental agreements** Existing Intergovernmental agreements with producers and transit countries aimed at the collaboration in the energetic sector. Interconnection Point Agreement (IPA): set of rules and procedures that must be adopted by interconnected TSO for the management of all cross-border transactions. The IPAs also contain a section that governs activities in cases of exceptional events, such as emergencies for lack or excess of gas. This events highlight the necessity of collaboration between the system operators, especially in the cases for which might be an impact on the security of supply. Procedures for Business Continuity management guarantee the business continuity against the occurrence of events that are serious enough to compromise the normal operation of critical processes
Economic **(E)**	Gas price volatility Trade dispute Market instability	Definition of contractual clauses aimed at preventing the interruption of supply due to variation of market and economic conditions.
Natural Events **(N)**	Natural disaster Exceptional weather conditions Pandemic	**Interconnection of the gas grid** The construction of gas pipelines and network installations is based on the choice of routes that minimize hydro-geological risk impact. Most of the import lines have been duplicated or triplicated over time. **Redundancy of serves** The Dispatching control room has a backup site (with redundancy of both operator posts and servers).

6.2. Structured system of communication and coordination measures

A structured and transparent system of information regarding possible critical situations and their solutions shall be defined, particularly:

- Information about system situation (demand forecasts, residual margin of storage capacity, curve of degree day temperature, historical and forecasted cumulative imbalance of the system, etc.);
- additional information during the gas day by means of real time tele-metering of entry/exit points of the system, on the basis of the developments indicated in the "Plan of Technological and maintenance requalification of metering plants" prepared by the TSO according to ARG/gas 184/09 Resolution (with a possible extract and anticipation for the thermoelectric final users);
- publication of forecast studies, structured like ENTSOG's "winter outlook" and "summer outlook", prepared by the main TSO and whose frequency of publication could be increased in relation to various level of crisis;
- result of demand side curtailing measures based upon voluntary agreement and possible evolution of new contractual structures aimed to incentivize a wider participation of industrial customers;
- development of a continuously improving data exchange coordination among gas and electricity system operators (exchange of gas day – 1 and gas day program data, real time measures of gas consumption of thermoelectric users, coordinated measures for the emergency management);

- information about IT structure risk management (*cyber crime*). This kind of risk could affect the strategic infrastructures such as, broadly speaking, gas infrastructures (e.g. pipelines, compressor stations, storage facilities, LNG terminal).

6.3. Gas balancing market and Security of Supply

Market balancing is the key concept for the operation of the gas system: the balancing mechanisms reflect the real needs of the system, given the resources available to the operator of market balancing, and encourage users to balance efficiently their injected and withdrawn volumes.

Users have the responsibility to balance their injected and withdrawn volumes in order to minimize the balancing actions to be taken by the operator of balancing market taking part to the overall improvement of the security of the Italian gas system.

In accordance with the resolution of the Authority ARG gas 312/2016 related to the gas balancing market established by EU Regulation n. 312/2014, from 1st October 2016 will start the new balancing regime based on market criteria. Consequently, each gas market operator will be empowered through economic mechanisms to balance its commercial position. The mechanism will promote market liquidity and will be one of the instruments for guaranteeing security of supply stimulating gas market operators to source sufficient amounts of gas necessary to cover demand. TSO makes available to the Users continuous information about the situation of the gas system and about the commercial positions of the Users and also the possibility of the hourly renomination from the gas day-1 for the gas day.

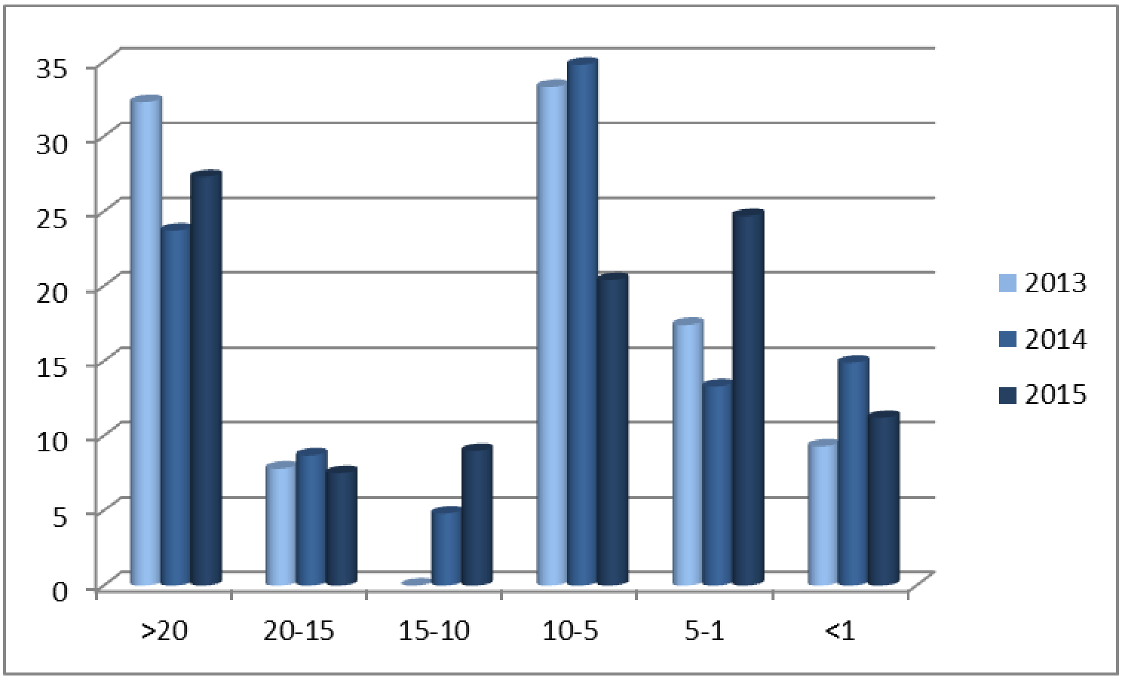
In this balancing system, although storage remains the main source of flexibility, by means of the other market tools available, also the other interconnection points (imports and LNG) can be used as flexibility tools.

8. FURTHER MEASURES AND OBLIGATION

7.1. Import contracts

In the last Regulatory Authority outlook, published in the 2015 yearly report, the remaining contractual period for active contracts against 2013 and 2014 data is shown in the graph below.

Figure 19 – Remaining contractual period (years) of import contract



Source: AEEGSI

Looking to the residual duration, import contracts in force in 2015 are, by far, long term (from 5 to 20 years), and are lightly decreasing considering 2013 data. The 56% of current contracts will expire in the next 10 years. Moreover, in 2014 and 2015, there is an increase of contracts with residual duration from 10 to 15 years (in 2013 there were not contract of these residual durations). In 2015 contract with residual duration from 1 to 5 years are clearly increased with a corresponding reduction of the contract with longer residual duration. Contracts whit duration shorter than 5 year are the 35.9% of the total. Based on the information from report of the Authority the "*Annual Contract Quantity*" under the figure 16 data has decreased from the 119 Bcm agreed 5 year ago to the 85 Bcm of the contracts in 2015.

In the last few years, as a consequence of structural changes in the gas market, an intense renegotiation of long-term contracts for gas supply occurred. The recent legislative changes have driven a lot of renegotiations with the aim of changing the contractual clauses related to the long term price and to the flexibility of volumes in order to adequate the contracts to the economic and regulatory changes.

A renewal of the long term expiring contracts, with similar volumes of gas and duration, is unlikely, due to the current market conditions characterized by variability, low demand and availability of gas on spot market. The gas market is more and more far away from the contractual schemes that have been used and that build up the security of supply in the past.

A part of gas demand is currently met purchasing gas at European hubs that during the years have become more and more liquid. The increase of spot volume could represent a risk for security of supply caused by the lack of a minimum guaranteed flux of gas as provided by long term contract (take or pay clauses).

7.2. Intergovernmental agreements

Intergovernmental agreements with other countries which could have some effects on the development of gas infrastructure and supplies are those listed below:

- agreement between Italian Republic Government and Democratic and Popular Republic of Algeria Government for a gas pipeline between Algeria and Italy through Sardinia (GALSI), published on the "Gazzetta Ufficiale" of Italian Republic n. 180 of 23 July 2008;
- agreement between Italian Republic, Greek Republic and Turkish Republic for the development of the Turkey-Greece-Italy gas transmission corridor;
- agreement between Italian Republic and Helvetic Confederation of 2012, for the cooperation in energy and gas sector and, particularly, for the development of efficient mechanisms for capacity allocation of daily products, in reverse flow as well, trough Transitgas;
- agreement between Italian Republic, Greek Republic and Albanian Republic of 2013 about TAP project in order to enhance gas import from Caspian region.

The agreement with Algeria is in force as it has been ratified by both parties (published in the Journal Officiel de la Répubblique Algérienne Démocratique et Populaire n. 14 of March 12th 2008) while the Turkey-Greece-Italy agreement still has to be ratified by Turkey. The agreement with Switzerland is in force (no ratification needed) and the one related to TAP project has been ratified by the concerned Countries.

All the Projects of Common Interest (PCI) are examined in the European Ten Year Network Development Plan (TYNDP) by ENTSOG, that is taken into account also for the Italian development plan.

European Commission in the publication of the 17th February expressed the need to increase the transparency of the future intergovernmental agreements. In the mentioned document the Commission furthermore suggest to introduce ex-ante checks about the compatibility with the competition regulation and the legislation of the internal energy market. Members states should take into account the Commission opinion before signing agreements.

7.3. Agreements and cooperation initiatives with European countries

The following text describes the agreements and initiatives developed by Snam Rete Gas in collaboration with other European operators.

First of all, an agreement concerning the Russian import line exists among Snam Rete Gas dispatching centre and Ukraine (Ukrtransgas), Slovakia (Eustream) and Austria (Gas Connect Austria, TAG) dispatching centres. The purpose of this agreement is to establish cooperation between the dispatching centres of the Countries through which the gas from Russia flows, in order to guarantee a continuous exchange of information for Security of Supply purpose. In summary, the agreement requires that the dispatching centres of the 4 countries quickly and promptly report anomalies related to the current and projected gas flows, emergencies and unexpected failures on the transport network, the impact of works and maintenance on transport capacity, and anomalies related to the physical and quality specifications of the gas being transported.

Snam Rete Gas also participates to the "Regional Coordination System for Gas (RCSG), EU dispatching service" initiative set up at ENTSOG with the aim of enhancing the interaction between the European TSOs, in particular in the event of a crisis or emergency and to support a continuous exchange of information to ENTSOg in the Gas Coordination Group.

The RCSG is based on different task forces (Regional Coordination Teams, RCT's), involving the representatives of the dispatching centres of the Member States involved in the main supply corridor, with the aim of improving security of supply levels in case of pre-crisis or crisis situations, increasing the quick information exchange among the TSO and providing the involved TSO's with possible solutions or re-actions (e.g. redirecting of the gas flows). Currently Snam Rete Gas participates to the RCT East (Russian gas flows) and to the RCT North-West (North European gas flows).

7.4. Analysis of interactions and agreements in place with neighbouring countries

Snam Rete Gas has entered into agreements with carriers from neighbouring countries, the so-called Interconnection Point Agreement (IPA), with the goal of establishing a set of rules and procedures that must be adopted for the management of all cross-border transactions to enhance the interoperability of the interconnected pipeline systems. Snam Rete Gas has IPAs in place with the following system operators in neighbouring Member States:

- Austrian system operator Trans Austria Gasleitung GmbH for the Tarvisio interconnection point;
- Swiss system operators Transitgas, FluxSwiss and Swissgas for the Passo Gries interconnection point;
- Slovenian system operator Plinovodi for the Gorizia interconnection point.

In addition, Snam Rete Gas has an IPA in place with the GreenStream system operator for the Gela interconnection point for the gas coming from Libya, and with TMPC, Transmed, TTPC system operators, for the Mazara interconnection point for the gas coming from Tunisia.

These agreements address operational and technical issues related to gas transactions at the interconnection entry and exit points with foreign countries, with regard to nomination and allocation of gas quantities, management of metering, flow control and gas quality, exchange of information as well as coordination of maintenance activities.

The IPAs also contain a section that governs activities in cases of exceptional events, such as emergencies for lack or excess of gas. This is a relevant section of the agreements that highlights the collaboration between the system operators, also in the cases for which might be an impact on the security of supply.

In case of emergency due to a lack of gas, the operators shall cooperate in order to minimize any constraints (e.g. maintenance) and to ensure maximum availability of respective systems.

In cases of emergency due to excess gas and other gas emergencies throughout the day, the system operators' dispatching and control centres that detect the emergency are required to inform all interested operators within 30 minutes. The dispatching centres of the operators involved must take all reasonable steps to minimize the impact of the emergency. System operators are required to update all interested parties on the progress achieved in the management of the emergency.

In order to manage the difference between the nominated quantities and the actual gas flow ("steering differences") at the Tarvisio interconnection point, as well as to guarantee to the network users the correspondence between the quantities nominated and allocated at the same interconnection point, Snam Rete Gas established with the Austrian system operator TAG GmbH an Operational Balancing Agreement (OBA) and is working to adopt this kind of agreement also with the Slovenian and Swiss operators.

Finally, for the purpose of offering bundled capacity products at the interconnection points between EU countries, in accordance with the ENTSOG CAM Network Code, Snam Rete Gas has established with the neighbouring Austrian system operator TAG a Cooperation Agreement and is going to finalize the same agreement with the Slovenian operator Plinovodi.

9. INFRASTRUCTURE PROJECT

8.1. Storage capacity

There are four new storage sites under development, contributing to an increase in storage capacity of 4.1 Bcm:

- Bordolano in Lombardy, developed by Stogit;
- San Potito and Cotignola in Emilia Romagna, developed by Edison Stoccaggio;
- Cornegliano in Lombardy, developed by ItalgasStorage;
- Cugno Le Macine, developed by Geogastock.

Development activities of Stogit also include the following projects:

- development of a new storage site ("Alfonsine") in the province of Ravenna;
- upgrading of the existing storage sites Fiume Treste, Minerbio, Ripalta, Sabbioncello, Sergnano and Settala.

With reference to the initial commissioning date these projects are currently delayed.

8.2. LNG e Small Scale LNG (SSLNG)

Referring to regasification capacity, in addition to that from the three already operating terminals (connected to the entry point of Panigaglia - GNL Italia, Cavarzere – Adriatic LNG and Livorno – OLT), it is valuated to be sufficient an increase of regasification capacity of 8 Bcm/y in order to spread the diversification of supply sources, to re-balance the Italian high exposition to pipeline supply from a small number of foreign producers and to contribute to the strengthening of security of gas system in crisis condition as well, particularly in terms of peak demand thanks to regasification peak capacity.

In order to increase the efficiency of LNG plant and to diversify their employment "Small Scale LNG" (SSLNG) services should be developed. SSLNG is a way to use liquid LNG directly (a different use than regasifying LNG in the dedicated plant and inject the product in the transport network).

Italian LNG plant can't supply SSLNG facilities. Operators are evaluating the feasibility of the technic-operative revamping useful to offer the new services in addition to the regasification activity.

Apart the technical cost associated to the service, the engineering, the construction and the management of the SSLNG facilities must be compliant to the reference normative/law for the regasification plant. Despite the authorization process is defined, the simplification/time reduction in a time to time perspective can facilitate the operator that want to develop this kind of service.

In the EU context for the development of SSLNG, Italy participates and coordinates to the Costa project (CO2 & other Ship Transport emissions Abatement by LNG) proposed by "Direzione Generale per il Trasporto Marittimo e per Vie d'Acqua Interne" (coordinated by RINA) presented as part of the announcement of the TEN - T networks in 2011. Also Greece, Portugal and Spain are involved in the project.

A national strategy on LNG is under development.

8.3. New infrastructures for gas transport

Italian gas system has a perfect position to take advantage from new routes of gas supply. Italy imports gas via pipeline from Russia, Algeria, Libya, Norway and Netherlands and via LNG from Qatar.

In the next years Italy will take advantage from gas supply from Azerbaijan and eventually from Turkmenistan. TAP pipeline (*Trans-Adriatic Pipeline* starting from Turkish-Greek border will cross Greece and Albany to land in Italy), connected to TANAP (*Trans Anatolian Pipeline* that will cross Turkey from east to west), will supply 10 Bcm/y of gas from Caspian sea by 2020, and successively further supply from Turkmenistan. Snam S.p.A. is directly involved in the TAP realization having finalized in December 2015 the acquisition of the 20% share owned by Statoil Holding Netherlands B.V.

Also Poseidon pipeline is inserted in the PCI list. Poseidon, part of the gas corridor through Turkey Greece and Italy (ITGI), will connect Greece to Italy. The project will allow import of natural gas from Caspian Sea and Middle East to Italy and Europe. The project is complementary to the other existing or developing route such as TAP and North Stream 2. ITGI was imagined 10 years ago and had been stopped a lot of time. Nevertheless in the early months of 2016 infrastructure was approved by European Union and construction should start during the year. The pipeline would bring about 10 Bcm/y Azeri gas for 50 years.

All the Projects of Common Interest (PCI) are examined in the European Ten Year Network Development Plan (TYNDP) by ENTSOG, that is taken into account also for the Italian development plan.

10. ADOPTION, DURATION AND UPDATE OF PAP

In compliance with art. 5.4 of the Regulation, the Preventive Action Plan is updated every 2 years unless circumstances warrant more frequent updates, and shall reflect the updated risk assessment.

The proposal for a regulation that, if approved, will repeal the Regulation (EU) No 994/2010 of the Council, suggest a different timing for updating the document. The Commission suggest that "*It could be also argued that agreeing on the plans at regional level is likely to be more time-consuming and require additional arrangements. For that reason, and to limit the additional burden, the regional risk assessment and regional plans could be updated every four years, instead of every two years, as is the case under the existing Regulation.*"

ANNEX 1 : STRESS TEST REPORT FOR THE ITALIAN GAS SYSTEM

The European Commission has invited all the Member States to elaborate, by the end of August 2014, a specific report, a so called energy security stress test, with reference to the risk assessment of supply disruption in the short term.

Based on this request, the Italian Ministry of Economic Development has prepared, for the Italian gas system, this report to cover the following items:

- thorough risk assessment for the winter 2014-2015 in anticipation of a possible supply disruption due to the suspension of gas transit through Ukraine or of the entire supply of Russian gas to the EU;
- list of the possible measures to be implemented in order to deal with the emergencies during the suspension of supply, based on the results of the scenarios analysis

The report consists of a power point report including all information about the following:

- Summary of the Stress test results
- Overlook of the Italian gas system 2013
- Storage situation for winter 2014-2015
- Stress test Assumptions and Scenarios
- Methodology
- Summer 2014 Injection Scenario
- Winter 2014/2015 Scenario
- Solidarity Measures
- Emergency Management procedures
- Measure of Emergency Plan
- MS Cooperation Report

Some additional comments and consideration are included in the following pages.

The following assumption have been taken into account in the evaluation of the following scenarios analysed to evaluate the risk and the impacts, as indicated by the European Commission in application to the Italian context:

- CASE A (One month disruption scenario): total interruption of Russian/Ukrainian supplies - through the Tarvisio entry point – has been considered for a period of one month, February 2015, when the storages level is relatively low but cold spells may still occur;
- CASE B (Long disruption scenario): total interruption of Russian/Ukrainian supplies - through the Tarvisio entry point – has been considered starting in summer, when the storages are not necessarily full, for a period of six months, from September 1st, 2014 to February 28th, 2015.

It should be noted that, for the Italian gas system, an interruption of the gas transit along pipelines that cross Ukraine is substantially equivalent to a Russian supply disruption and vice versa and results in a shortfall of gas flows into the Tarvisio/Arnoldstein Entry Point: for this reason, we have developed for each scenarios (Case A and Case B) two different hypotheses: a best case, where it is easier to find additional supplies from other entry points, and a worst case, where it is very difficult to find other sources of supply, i.e. a scenario equivalent to a full disruption of Russian gas to Europe for all interested pipelines.

Italy is the third largest natural gas market in Europe, with a consumption of 70 bcm in 2013 and it is dependent on gas imports for 90,5%. Natural gas had a share of 37% in the total primary energy supply of Italy in 2013 and represents the primary fuel for power generation in Italy (39% of total electricity generation in 2013).

Consumption of natural gas has decreased in recent years. Reasons for this are the economic crisis in Italy, which led to less demand especially from the industrial sector, the rising share of renewables in energy production (especially in electricity), and the increase of energy efficiency.

Italy imported 90,5% of its natural gas demand in 2013 and its imports are relatively well diversified. The two main import countries are Russia and Algeria, who accounted for 69% of the imports in 2013. Other important producer countries are Libya (9%) and Qatar (9%). There are also significant gas imports from the Netherlands and Norway. 9,5% of natural gas demand is met by domestic production. Domestic production has progressively declined (from 12 bcm in 2005 to 7,7 bcm in 2013).

The vast majority of imports are delivered via four pipelines (Transmed, Greenstream, TAG, Transitgas). The combined technical maximum daily import capacity is 376 mcm/day. Utilisation rates are low, the highest being Tarvisio importing Russian gas, and for this reason this high value of import capacity (about 109 bcm/year, far beyond national consumption) does not mean at all that in case of disruption the Italian gas system can face all the problems that could occur, especially in a winter situation.

This fact highlights one of the shortfalls of the so called N-1 formula to describe the security of a gas system of a Member State, because it takes into account the technical import capacity at the interconnection points between the grids and not the allocated transport capacity at the beginning of each thermal year nor the mean utilisation rate, neither the maximum daily volumes established within the supply contracts that are delivered at the same interconnection points. The outcome is that the N-1 is just a necessary, but not sufficient condition for the evaluation of the security of the gas system of a Member State; some modifications to have this formula perform a better evaluation of the actual security of supply could be introduced within the foreseen update of the 994/2010 Regulation.

Recently, imports from Algeria have decreased while imports from Russia have picked up (amounting to 49% of total gas imports in 2013). The reasons for this are commercial: the imports of Russian gas have proved cheaper. Most of the imports occurs by means of long term Take or Pay contracts whose price formulas are oil linked, thus resulting in very high prices with respect to the spot market. Some recent negotiations of Italian importing undertakings with Gazprom succeeded in having some discount introduced in the prices, while renegotiations of contracts with Sonatrach are very difficult. Some importing undertakings have resorted to arbitration tribunals to solve this problem, while others are still negotiating: the outcome is that import from Algeria declined in the last three years from 27 to 13 bcm replaced by imports from Russia. Sonatrach has no interest in closing such negotiations, because in the meantime is using its production to supply LNG that can be offered at higher prices in the international markets.

This fact introduces a high uncertainty about gas volumes that could be supplied to Italy during next winter from Algeria; preliminary information from the three major Italian importers are that the imports will be further reduced with respect to 2013, and it is not clear if in case of emergency the daily volumes could be increased on demand, even paying gas at the very high oil linked price.

For the same reason it is very difficult to consider that additional volumes from Algeria could be supplied to Europe through the Italian network in case of a disruption of Russian gas, unless a sharp increase of gas prices in the Italian and EU gas market takes place. This information has been shared with neighbouring MSs in the bilateral coordination process in August and during the web conferences organized by the Commission.

The remaining 9,5% of imports are delivered to Italy as LNG cargoes. There are three LNG terminals in operation, but at a very low utilization rate. Two terminals (one has some operational limits for the maximum tonnage of the ships) have no LNG cargoes scheduled to be shipped during next winter.

Nevertheless, it is again very difficult to assess the possible additional LNG supply that could be imported to Italy, and through the Italian network to other Member States, because the only affordable scenario is the utilisation of the flexibility of the existing LNG contracts with Qatar and Nigeria; in the one month scenario it is not prudent to consider additional cargoes to be immediately rerouted to Italy. Only in the 6 months scenario the LNG supply from the international markets could be moved to Europe, using the flexibility in other international contracts, the spot markets, the reduction of LNG demand in other areas, as outlined in the preliminary report that IEA is preparing within the G7 Energy Rome Initiative framework, but only considering the hypothesis of a huge increase of gas prices in EU, at 16-20 $/MBTU.

Italy has storage capacities of 16.4 bcm (11 storage facilities in depleted fields) of which 4.6 bcm are reserved as strategic storage (gas owned by storage undertakings). Commercial storage has been fully allocated during the injection campaign in 2014, thanks also to the new allocation methodology introduced in Italy that used an auction mechanism based on continuous monthly offers of injection space. The space offered to the market has been already filled for 89%.

If no problems occur, it will be possible to reach the full injection of the commercial storage for 12,2 bcm (at 38,1 MJ/cm). In the 6 months scenario, with a disruption of Russian gas supply through Ukraine starting from September 1st, two cases have been considered: the best case that leads to an injection up to 11,4 bcm and a worst case (that means a full disruption of Russian supply to EU) with a final volume injected of 9,4 bcm.

For the purposes of the simulation process in the two required winter scenarios, 2 cases have been considered, which are distinguished by different levels of the additional inlet flows considered available at the entry points:

- ”BEST CASE” – the considered inlet volumes represent reported quantities at the entry points in the recent past and evaluated as repeatable even under analysed stress conditions;
- ”WORST CASE” – the considered inlet volumes represent the reasonably conceivable minimum level in a very severe condition, that can be considered equivalent to a full disruption of Russian gas to EU.

All the considered scenarios are analysed and presented in terms of total volumes for the period. They do not take into account the effects of the possible non-market measures and are based only on market measures. Thus their results indicate the total amount of additional gas that needs to be found by means of non-market measures or, if they fail, the amount of gas that cannot be supplied to the system and that need measure to curtail the demand.

The possibility to curtail demand for final customers is considered only in case of a long and severe disruption (in the worst case of the 6 months scenario); such measures would not affect protected customers (the reduced amount of gas would be shared by the industrial and power generation users).

The analysis of the scenarios in terms of peak performance of the storage system has been also made, but they have not been included in this report; they are available to the Commission if requested. In the six months scenario large impact on peak performance of the gas system are present, thus indicating the need to prepare short term measure in case a severe winter condition occurs during the disruption.

The Ministry is also adopting a peak shaving mechanism by means of the use of LNG regasification terminals as a LNG storage, launching public procedures for the offer of this service, to be used in case of a peak demand that could not be covered by regular storage for some days.

The simulation results have been obtained starting from actual data and forecasts (till March 31st, 2015) substantially related to 3 items: demand, inlet flows (from domestic production, LNG terminals and imports) and storage level. The total demand has been considered by summing the contributions of power generation, provided by TERNA (the Italian TSO of the national electricity grid) to the demand of the residential and tertiary sector and of the industrial sector, that were estimated on the basis of the data observed in prior periods and assuming a normal climate (average winter). Then, through the application of appropriate coefficients, the daily profile has been determined.

Regarding the inlet flows, for each of the 3 cases (Base, A and B) and for each reporting period (summer and winter) daily average inlet amounts at each entry point into the national network have been assumed.

The daily inlet volumes recorded in recent times at each point have been used as a reference and, with a certain degree of confidence, an increase in the inlet quantities at the entry points different from Tarvisio during its unavailability periods have been foreseen (in some cases).

It should be noted that these increases are compatible with the constraints of technical and booked capacity of the infrastructures and are modelled on volume trends therein transited in previous periods.

It is still to be noted that the above estimated inlet values actually depend largely on commercial decisions of shippers.

The storage level at the end of each period is calculated as the algebraic sum between the amount present at the beginning of period and the difference between the total inlet quantity and the total demand (injected if positive, withdrawn if negative).

The main results of the scenarios are reported below.

To take into account gas prices dynamics in case of emergency, the spike prices registered during the last February gas crisis have been considered , with respect to actual forward prices at TTF and NBP for January 2015 (25,58 and 27,04 Euro/MWh respectively).

Scenario	Best Case	Worst Case
1 month	No impact on Volumes supplied to customers	Small impact on Peak performance of the System that can be tackled by means of measures already foreseen in the Emergency Plan
6 months	Total withdrawal of commercial storage and limited withdrawal of the strategic storage Large impact on Peak performance of the system	Total withdrawal of commercial and strategic storage and system deficit for 2.1 bcm Need to curtail gas demand of industrial and power generation sectors

The market and non-market measures are listed in the report.

The specific Committee established within the Directorate General for Security of Supply and Energy Infrastructures of the Ministry of Economic Development has developed since its establishment good skills and experience in managing gas emergencies, and the procedure for adopting immediately different measures taking into account the situation is proven, with real time connection with the TSOs (including TERNA), the LNG and the storage undertakings operating in Italy. In the report the structure for the management of emergency situation has been described, according to the Emergency Plan adopted and communicated to the Commission.

An evaluation of the additional gas that could be imported to Italy by means of LNG is in progress, including the results of the report that IEA is preparing within the G7 Rome Initiative framework. New non-market measures for LNG are under evaluation, based on the possibility to have a call option for LNG supply in case of emergency.

An updated report will be sent to the Commission by the end of September, considering the effective level of the gas in the storages, assuming that no disruption has occurred.

In the report also some solidarity measures are included, in particular the possibility of virtual and physical reverse flow. In 2016, the Italian network will be able to export from South to North (assuming that enough gas is available from Algeria and Lybia) about 40 Mcm/day as the sum of interconnection points with Switzerland and Austria. During next winter 18 Mcm/day at the interconnection point of TAG, 2 Mcm/day at the Slovenia border and 5 Mcm/day at the Swiss border will be available for reverse flow.

The interim report sent to the Commission has been sent to the competent authorities of Austria, France, Switzerland, Slovenia and Germany. Slovenia and Switzerland sent back their interim reports, and the German Ministry sent a mail with some information; specific solidarity measures with neighbouring Member States will be studied as soon as the Ministry receives their reports.

ANNEX 2: METHOD FOR THE DETERMINATION OF CLIMATE RISKS

Calculating 1-in-20 demand

Article 6 of the SoS Regulation, entitled "Infrastructure Standard" requires that, in the event that the major gas infrastructure fails, the capacity of the remaining infrastructure must be able to meet the total gas demand of the calculated area during a day of exceptionally high gas demand, which is statistically likely to occur once every twenty years.

The demand for gas in Italy is particularly influenced by the seasonality of domestic heating. Hence, the maximum demand has been calculated as the gas demand occurring in an exceptionally cold winter day (i.e. a winter working day characterized by cold temperatures throughout the national territory with a probability of occurring once every 20 years).

The method, used by Snam since the '90s, to correlate the consumption of gas to temperatures is a direct method based on statistical analysis applied to the weather and natural gas consumption data.

Conventionally, the Italian territory served by natural gas transmission network has been divided into 18 climatic zones, each one having its own weather station and being characterized by a certain degree of climatic affinity, defined upon the following criteria of aggregation:

- similarity among daily cumulated degree day over the year;
- being located on the same geographical side (i.e., east or west of the Apennines mountains ridge);
- same altitude above the sea level.

The climatic zone establishes an intermediate level of aggregation (bigger than the single or aggregated city gate, smaller than the national level), over which the correlation between temperatures and gas consumption for house hold heating can be calculated.

For the purposes of this document, the method used to sort the volume of gas related to house hold heating, out of the total gas demand, is omitted. Hereinafter, gas consumption means gas consumption for house hold heating.

To define a unique value of temperature for the whole Italian territory, the following method applies, based upon a complete set of historical temperatures and the gas consumptions of each climatic zone in the last year.

To define a unique value of temperature for the whole Italian territory, the following method applies, based upon historical series of temperatures and gas consumptions of each climatic zone, recorded during the previous calendar year.

These historical series of temperatures, recorded at the weather stations of the 18 climate zones, are available starting from winter 1962-63.

The temperature in Italy, in degree-days, is obtained as a linear combination of the degree-days of the 18 climatic zones, weighted by monthly consumption gradient of the same climatic zone of the previous calendar year:

(1) $$gg^m = \sum_{z=1}^{18} a_z^m \cdot gg_z^m$$

with:

$$z = 1,......,18$$

$$a_z^m = \frac{g_z^{m,y}}{\sum_{z=1}^{18} g_z^{m,y}}$$

where:

gg^m : degree day Italy, in a day of winter month m

z: counter, from 1 to 18, of the climatic zone

a: weight, associated to each climatic zone z during a winter month m, to be applied to degree day values measured in each weather station

gm, y: monthly gas consumption gradient of the climatic zone z, in the last gas year y. Such gradient is calculated as the sum of gas consumptions of the climatic zone, in a certain period of time, divided for the sum of degree day (i.e., the cumulated degree day), within the same period of time. In this case, the period of time is the month.

The historical series of the Italian temperature curves obtained with this method will have the same historical depth of the series of temperatures of each climate zones. Subsequently, the series of maximum temperatures is calculated (series of maximums) by extracting for each year the maximum value of the Italian temperature curve (the curve of the maximum temperatures of the period, expressed in degree-days is represented in Figure 20).

A multiplicative factor is obtained through a statistical analysis of the series of maximums. The factor is applied to the Italy normal curve and allows to determine the daily temperature curve associated with a thermal risk that has the probability of occurring once every 20 years (equal to 5%).

The statistical methodology used to assess the maximums is based on the Extreme Value Theory (EVT) applied to the series of maximums of temperatures in Italy (one for each winter).

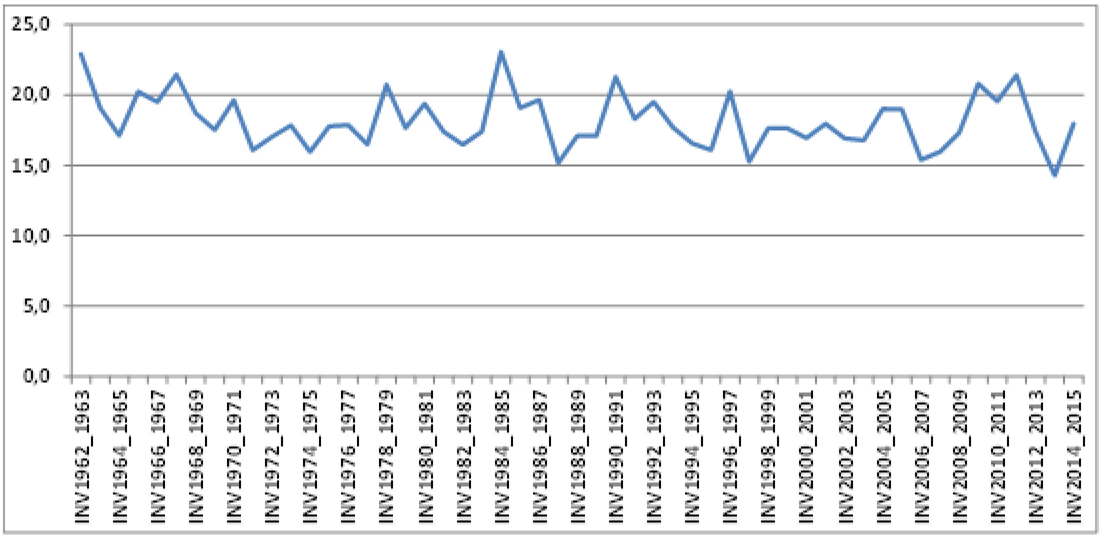
The series is analysed using the method of maximum probability, in order to estimate the parameters to apply to the EVT distribution curve and to calculate the 95th percentile.

To determine the curve of exceptionally cold days that have a probability of occurring once every 20 years, the previous value is calculated an applied to the curve of normal temperatures in Italy (Italy Normal Temperature), built as the average of the temperatures in Italy starting from 1962-63.

Lastly, to account for the difference between the curve of the average temperature in Italy calculated over the entire historical series (from 1962-63), and the curve of the average temperature in Italy over the last 20 years, presenting warmer temperatures, a correction has been done to the above-mentioned curve of exceptionally cold days in Italy. The correction is done through a reduction coefficient of 4.9%, equal to the average of the ratio of the two curves in the December-February period.

Based on this methodology, it is possible to obtain a curve which is greater than the normal curve by a factor equal to 70%. This curve is used to evaluate the N-1 formula and other formulas, in this Document.

Figure 20 – Daily maximums recorded from winter 1962-1963 to winter 2014-2015



Source: Elaborations on Snam data