PRIVATE INTERCONNECTORS TO FACILITATE MARKET THROUGH A REGULATED PRIORITY ACCESS: THE GRTN'S EXPERIENCE ON THE PROCESS OF IMPLEMENTATION IN ITALY

G.Manduzio, C. La Ianca, M.Rebolini, D.Sapora, A.Serrani
GRTN-Rome, Italy
gabriele.manduzio@grtn.it

Abstract – In 2002, so before EU Regulation 1228/03 entry into force, the need of market facilitation tools for the electricity sector was recognized by the Italian Electricity and Gas Regulator (AEEG). Then, a "precursory" provision was launched by AEEG, envisaging the possibility for private investors to build-up interconnectors with neighbors power systems and to remunerate investments by a regulated priority access to the capacity made available by infrastructures. The paper provides a detailed overview of the process of implementation put in place by GRTN in compliance with the defined regulated path and points out the several and complex issues tackled during the operational phases. This experience can be considered peculiar due to the huge number of initiatives delivered by private investors, as a consequence of the high differential price between the Italian electricity market and the neighbors. In fact, the amount of projects delivered has drastically increased the complexity of the whole procedure and, in particular, has made difficult the implementation of the pre-packed AEEG guidelines during the phase of capacity assignment. In addition, a number of structural criticalities have globally affected the process and further increased its fulfillment. A transversal lecture of the experience highlights the TSO's difficulty in keeping a fair, transparent and not-discriminatory role and reconciling on one side the priority of ensuring the system security, on the others the private investors' expectations in terms of transmission capacity.

Keywords: Interconnectors, private, transmission capacity, allocation, market facilitation

Table of abbreviations:

TSOs	Transmission System Operators
AEEG	Autorità per l'Energia Elettrica e il Gas
GRTN	Gestore Rete di Trasmissione Nazionale
MAP	Ministero delle Attività Produttive
TC	Transmission Capacities
ML	Merchant Lines
PSTs	Phase Shifter Transformers
ATRs	Auto TRansformers
RTN	Rete di Trasmissione Nazionale

1 INTRODUCTION

Within the process of establishment of the EU Internal Electricity Market, incentives continuously come from the stakeholders to the Transmission System Operators (TSOs) to facilitating the international electricity trading. TSOs' initiatives for new infrastructures to enhancing interconnections yet might collide with a series of feasibility problems, such as complex authorization patterns and environmental issues. In some cases, as for the HVDC links, also the cost of the investments might be considered excessive to bear by TSOs.

The option of a regulated priority access to the interconnection grid for private investors has been contemplated in 2002 by Italian Electricity and Gas Regulator (AEEG), through the issue of the decision 151/02 (from now on "151") [1] and following integrations. Main aims of the provisions were to facilitate the Italian electricity market, by promoting its internal concurrence and enhancing the interconnection capacity, guaranteeing lower-cost source of supply to industries. GRTN, in compliance with the AEEG's provisions, has put in place appropriate procedures to collect and evaluate the projects of private interconnectors or Merchant Links (MLs) and to assign them transmission capacity (TC) priority rights in the respect of the interconnected system security. The paper contributes the GRTN direct experience on the issue, developed within the long, and presently frozen, phase of implementation of the regulatory provisions.

The paper is structured as follows. In chapter 2 the objectives and main aspects of the regulated pattern, as defined by 151 and following, are illustrated with particular reference to the modality and conditions for priority access. In chapter 3, an overview is provided of the laborious process of implementation undertaken by GRTN to comply with regulatory provisions, starting from the collection of declarations of interest through MLs technical evaluations till the TC rights attribution. In chapter 4, an analysis of the major criticalities faced during the implementation phase is provided, focusing first on the technical and computational aspects, and also on the structural and procedural issues that affected and made the whole process critical.

2 REGULATORY FRAMEWORK: MAIN ASPECTS OF AEEG DECISIONS

On August 1st, 2002, AEEG issued 151 [1] having as a subject the priority access to the transmission capacity of the interconnection for new infrastructures. The decisions 230/02 and 117/03 have later on modified and integrated what in 151. The AEEG mandates have been implemented by GRTN through the issue of official provisions and communications to the applicants.

2.1 Objectives and legal basis

By the discipline of the priority access to the TC on the interconnection for the realisation of new infrastructures, AEEG intended to contribute to promoting concurrence within the Italian electricity sector, suffering structurally of concentration and poor diversification of the national generators. Further purpose was to conjugate the contributions coming from private investors for the realisation of new infrastructures with the general interest of a reinforcement of the interconnection, normally managed by GRTN. The legal basis of the AEEG provisions comes from the Italian electricity act, which allows an extraordinary priority access to the TC on the interconnection, in order to mitigate possible verified TC shortages and to facilitate the import of electricity in favourable conditions (e.g.: the request from market participants for the access to the Italian interconnection in 2002 was 10 times higher than the available TC).

2.2 Priority access and investments remuneration

The discipline of priority access applied to the realisation of new interconnectors, whose Italian part was entitled to be included in the Italian Transmission Grid (RTN), and also to upgrading of existing interconnectors. It meant that the interconnectors were requested to have a voltage level equal or higher than 120 kV. The interconnectors were also asked to be in service not later than Dec the 31st, 2007, under penalty of lost of rights.

Concerning the modality of the priority access award, 151 requested to pursue the following steps, based on "incremental capacity" method, for each year analysed:

a. The assessment of the global incremental capacity $\Delta TC^{(All)}$ determined by the totality of MLs, considering as a starting point the existing RTN consistency, integrated with the GRTN published plan of grid reinforcements
b. The assessment of the incremental capacities determined by each MLi $\Delta TC^{(i)}$, calculated simulating in operation all the MLs except MLi
c. The attribution of TC priority rights to each MLi, in a quota of 80% of the global value calculated by splitting the global incremental capacity $\Delta TC^{(All)}$ among all MLs, proportionally to the incremental capacities $\Delta TC^{(i)}$ determined by the respective MLi.

The steps above have constituted the guidelines for GRTN to edit the procedure for TC assessment [2].

So, the rights of exclusive utilisation were defined to equal the 80% of the TC assessed to be made available by the new infrastructure[1], whilst the remaining 20% was to be allocated to the market. This priority access was granted for a period of 10 years, from the date of operation. The remuneration of private investors in carrying out new interconnectors consisted, in this first phase, exclusively of the regulated priority access to the cross-border TC, without envisaging any income from grid rent. After the 10 years of exemption, the investors would have kept the ownership of the asset and be remunerated through a regulated rent, as all the RTN owners in Italy. The applicants, once assigned TC rights, would have been also requested to sign a document of operational co-ordination with GRTN. In order to promote the plurality of the process, the maximum TC assignable to the single applicant was capped to 800 MW. The electricity imported through the priority access was scheduled to be exempted from the congestion fee between zones and was assigned a total priority within the offers of the relevant Italian internal zone.

It is worthwhile noting finally that no mention was made at this stage to any co-ordination with the neighbor Regulators and TSOs on this matter.

[1] Later on, it was specified that the exemption of 80%TC must have been calculated on the quota allocated by the Italian authorities. Concerning the part managed by the neighbours, the % of exemption would have been let to the case-by-case negotiations between applicants and authorities.

3 PROCESS OF IMPLEMENTATION OF PROCEDURES

To comply with 151 provisions, as in chapter 2, GRTN has undertaken relevant actions. The following steps of the implementation process can be identified:

- Collection and evaluation of Declarations of Interest
- Issue of procedural and technical documentation
- Establishment of an external Commission
- Evaluation of compliance of MLs preliminary projects with GRTN technical standards
- Definition of the quality ranking of reference and preliminary selection
- Implementation of security analyses, assessment of transmission capacities and assignment to MLs

Details are provided hereafter of the single phases of the implementation process. Within all the phases, GRTN has pursued the principles of transparency, fairness and not-discrimination and guaranteed the maximum participation of all the MLs applicants to the process.

3.1 Handling of Declarations of Interest (DI)

The phase of declarations of interest aimed at verifying technical-professional prerequisites of the applicant industries and the economic and financial guarantees of the consortiums. In February 2003, a public announcement was sent inviting to submit declarations of interest for the MLs initiatives. Appropriate documentation was requested to the market participants. In addition, for each DI, the main technical features were asked (such as voltage level, AC/DC, OH line/cable, new link/upgrading of sites of connection, thermal rating).

In June 2003, the list of the applicants admitted to the phase of projects presentation was published. On the whole, 49 declarations of interest were delivered, some of which including alternatives between AC and DC projects. The classification per border and voltage level is reported in figures 1 and 2. Initiatives admitted to the following stage were 42, then 1 of them was withdrawn by the applicant itself.

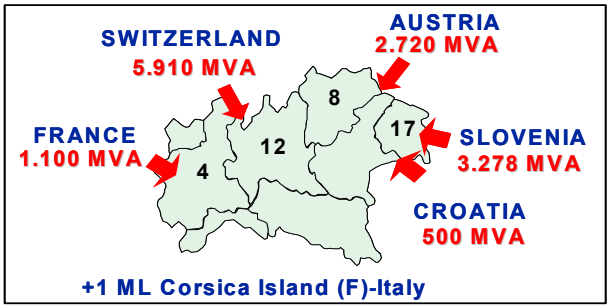

Figure 1: Classification per border (Declaration of Interests)

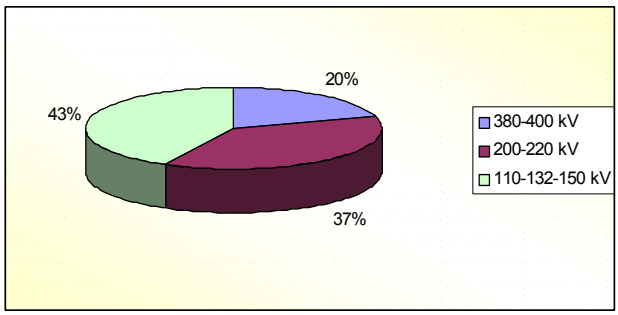

Figure 2: Classification per voltage level (Decl. of Interest)

The amount of additional TC requested by DI initiatives equal about 13000 MW; this value, further summed to the TC expected from GRTN planned reinforcements, evidently revealed as excessive for the requirements of supply of the Italian power system as well as for its security of operation[2].

3.2 Issue of technical and procedural documentation

As directly requested within the regulated path:

- In June 2003, a letter was sent to the applicants asking the applications for priority access rights and detailing the documentation to deliver. The letter had as annexes the procedure for the TC assessment [2] and the technical Guidelines for the preliminary projects [3].
- In April and August 2003, clarifications on the technical documents were published on GRTN website (www.grtn.it), on relevant applicants' requests
- In November 2003, a new letter was sent to the applicants updating the previous one in line with AEEG 117/03 decision instructions, meanwhile issued.

As a result of this step, the applicants were requested to deliver to GRTN the packages of the MLs preliminary projects, in line with the technical guidelines [3].

3.3 Establishment of the external Commission

Prior to accessing the packages containing the MLs projects and with the aim to guarantee the maximum transparency of the whole process of evaluation, GRTN has promoted the establishment of an ad-hoc Commission, composed of three external experts, independent and qualified for their technical or legal profile.

The Commission have been tasked to:

- Examine and evaluate the requests of priority access rights from MLs applicants
- Define the procedures for a technically and legally fair assignment of priority access rights to MLs projects.

The Commission has been assisted by a Technical Secretariat (TS), composed of selected experts of the GRTN divisions. Maximum confidentiality requirements on the treated information bound the involved experts.

3.4 Evaluation of technical and legal compliance

The evaluation of technical compliance consisted of the examination of the documentation from the point of view of technical suitability, compatibility with the operation safety of the power system and accordance with notification criteria. Examinations were carried out to check the respect of the technical Guidelines contained in [3]. The examination has checked, for every projects, overall electrical diagram, possible fulfillments of authorization, route and location of the electrical works, environmental feasibility studies, technical studies of the overhead lines or cable lines, electrical station projects (included possible conversion stations AC/DC), technical and functional characteristics of FACTS devices (such as PSTs), manufacturing stages and chronological programs, costs and unavailability plans of the concerned components of the national transmission grid.

The external Commission proceeded in parallel to the analysis of legal and procedural compliance of projects.

The outcome of this phase was an updated list of MLs projects considered compliant both with the technical standards and with legal and procedural requirements.

3.5 Qualitative ranking and preliminary selection

In line with the regulated path, a qualitative ranking of the MLs projects was built-up, based on technical and auditable criteria of assessment. The objectives pursued in defining criteria were to conciliate the TC maximization for MLs with a coherent development of the interconnection, the enhancing of system security and the diversification of the electricity supply from abroad.

The following four criteria of assessment were defined:

1. *Impact on the global incremental TC*, envisaging also a decrease of score for MLs afferent simultaneously to the same congested area, in Italy or abroad
2. *Impact on the global system security of operation and supply*. On this respect, DC links and AC with installed PSTs were positively assessed due to their capacity to control, completely or partly, the flows, in case of tripping of interconnectors. Also, 380 kV AC links were favored due to their capacity to contribute system security in N-1 security conditions.
3. *Impact on the grid topology*, privileging MLs
   - not creating congestion without GRTN grid reinforcements in place
   - strengthening borders having lower TCs
4. *Feasibility of realization,* and in particular:
   - Neighboring TSOs' documented consensus
   - Documented advanced status of authorization
   - Certified modalities of MLs financing

[2] Consultants engaged by some applicants then estimated as not more than 4000 MW the incremental capacity available for MLs on the Italian interconnection in security conditions.

GRTN has then assigned a score to each ML project. For transparency, information was given to the applicants on the criteria of assessment and the modality of scoring and classification.
The quality ranking was used as a transparent classification to refer to during a phase of preliminary selection. This phase revealed necessary in a few specific situations of direct concurrence among some of MLs. In such situations, the literal application of the "incremental capacity" method to a case of more MLs simultaneously afferent to a congested area would have determined results paradoxical and contrary to the 151 principles their selves. Specifically, the procedures to implement the "incremental capacity" method would have determined the self-elimination from the TC assignment of all the MLs afferent to a same congested area and, therefore, achieved a result opposite to the maximisation of the TC. In such situations (and exclusively in these ones), the utilisation of the qualitative ranking provided a criterion to select the projects, among ML(s) under concurrency, presenting the better qualitative credentials, based on transparent and non-discriminatory elements. Following the qualitative analysis, the TC assignment was performed in line with the "incremental capacity" method. This way, the principles of maximisation of the global TC and of the maximum participation to the process were saved and guaranteed.
The outcome of this phase was the list of MLs admitted to the phase of TC assessment and attribution.

3.6 Security analyses

- *Preparation of base cases and security rules*

Concerning the base cases of simulation, two datasets for a target reference year (2007) were selected among the official UCTE snapshots and were processed to reproduce the forecast conditions of the Italian and the neighboring countries grids. In particular, the forecast Italian transmission and generation system was modeled paying special attention to the northern Italian area, concerned by private interconnectors. In order to build-up a credible scenario for security analyses on the reference year, the power system was modeled as follows:

- Internal Grid: all the grid developments as in the most updated Development Plan.
- Interconnection: all the officially planned lines, subject of signed agreements with neighbors TSOs.
- Reinforcements to be inserted in the neighboring grids were officially requested to TSOs, in order to reasonably identify congestion abroad
- Generation: new power plants authorized and/or under construction were modeled.
- Demand: load pattern was modeled according to data provided by GRTN official statistics dept.

All the MLs, including whichever FACTS devices, were modeled in accordance with the information provided within the packages by the applicants. Also, all the restructuring or upgrading grid elements, declared in the projects as connected to the MLs operation, were modeled and made available for the simulation.

Concerning the rules for accepted overloads in N-1 security, the following modalities were implemented:

- the GRTN rules for Italian grid and interconnection
- max 100% of thermal rating on all the other elements of neighboring grids, as deduced from the official UCTE exchanged models. This was a conservative measure towards security, suggested by the fact that the TC assessment phase was performed without directly involving the neighboring TSOs within the security analyses.

A process of generation shifting was designed for gradually increasing the level of import on the northern Italian border. An automatic algorithm was implemented envisaging the increase of the generators of the whole European synchronous systems and an equal decrease on the Italian system, on a pro-rata basis of the rated power of the generators.

- *TC assessment and assignment*

The TC assessment and the security analyses of the interconnected power system have been run by GRTN applying the rules currently adopted within ETSO and UCTE, using the assumptions at previous paragraph.
As said in 2.2, the TC attribution to MLs was performed by implementing a technical procedure [2], worked out on the basis of 151 guidelines. So, with respect to the reference year, both for Winter and Summer scenarios during peak hours, the following values have been determined:

- The global TC value of the interconnection, calculated considering the grid reinforcements planned by GRTN and the neighbor TSOs: $TC^{NO\ ML}$
- The global TC value of the interconnection considering all the MLs operated simultaneously: $TC^{(ALL)}$ and the incremental TC made available by all the MLs simultaneously operated: $\Delta TC^{(ALL)}=TC^{(ALL)}-TC^{NO\ ML}$
- For each MLi, the global TC value of the interconnection excluding MLi from the simulations: $TC^{(ALL-i)}$ and the incremental TC assignable to MLi: $\Delta TC^{(ALL-i)} = TC^{(ALL)} - TC^{(ALL-i)}$
- The TC assigned to each MLi, calculated by splitting the $\Delta TC^{(ALL)}$ pro-rata of the $\Delta TC^{(ALL-i)}$ and multiplying for 80%, to determine the quota for priority access.

After calculations concerning the reference year, GRTN intended to run analyses also regarding off-peak scenarios, for Winter and Summer periods, considerably different for the interconnected system behavior.
Once concluded the whole calculation phase, 151 envisaged that applicants would have been given 15 days to evaluate the assigned TC priority rights and allowed dropping the MLs realization. In case of at least one renunciation, GRTN would have proceeded to carry out again the whole TC assessment phase, this time without considering the withdrawn MLs project.

The process of TC assessment and assignment to the MLs projects was stopped by the AEEG decision 73/04 on May 14th, 2004. This provision acknowledged the modified legal and regulatory framework on the matter

of priority access, as introduced by Italian law 290/03[3], meanwhile issued, and by EU Reg.1228, next to its entry into force, and blocked the 151 process, in the wait of the MAP decree for law 290/03 implementation. Consequently, GRTN and the External Commission suspended the procedures of implementation awaiting MAP determinations. Presently, all the 151 documentation is still covered by strict confidentiality and preserved in GRTN premises.

4 MAJOR CRITICALITIES OF IMPLEMENTATION

Since the beginning, the process of implementation of the procedures for MLs treatment revealed complex and critical. These criticalities have consisted of pure technical issues, related to the simulation phase, but were also structurally associated to the process. The main criticalities emerged are described in the following.

4.1 Structural and general criticalities

The process of MLs handling, as designed, has brought a series of criticalities structurally connected, partly due to the not harmonised EU legal framework at that time, before EU Reg.1228. Hereafter the main considerations:

1. The design of the process has left room to an unrestricted number of requests of new interconnectors and so of priority rights of access. In this context, GRTN, keeping a fair and not-discriminatory approach towards all the applicants, has guaranteed the principle of maximum participation to the procedures, if compliant with requirements and not endangering the system security or the principles their selves of the AEEG provisions. Hence, the great number of requests combined with the limited TC to be shared has inevitably collided finally with the structural limitations of the Italian power system and, in the end, the results would have probably not even satisfied the minimum expectations coming from the applicants as a return of investment.
2. The method of the "incremental capacity", predefined within the regulated path and adopted by GRTN during implementation, revealed to be critical and even unfit, particularly in case of application on the very numerous delivered projects as well as while treating interconnectors having voltage lower than 220 kV.
3. The implementation phase has suffered from an insufficient information and co-ordination among neighbor national authorities, first in establishing a common legal framework and then in defining the modality of allocation for MLs interconnectors border by border.
4. Within the regulated procedure in subject, the authorization pattern for the MLs projects was not treated and considered as faceable in a following phase. This way yet the TC assignment to the MLs had de facto only a theoretical value, since the authorization path is probably the most critical and decisive variable. Moreover, in case of problems in getting authorizations and possible renunciations, reasonably somewhere expected, a new set of calculations would have been needed.
5. The interconnection development by tools like MLs, let to the private initiatives, obviously does not present any criterion of technical planning, normally adopted by TSOs. Furthermore, some initiatives were in direct concurrence with the GRTN planning.

4.2 Criticalities of interface with neighboring TSOs

During the process, the issue of the connection with the neighboring TSOs clearly arose up as a key point.

- Lack of legal/regulatory framework uniformity

Starting from the first informative initiatives towards the neighboring TSOs, it immediately emerged the lack of a shared legal and regulatory platform for MLs initiatives. In some cases, the absence of a specific framework for MLs in the electricity law into force was identified, in other the existence of a legal and procedural design different from the one proposed in Italy. In all the cases, TSOs referred their difficulties in acting and collaborating with GRTN in absence of guidelines from their respective regulator and/or Ministry and urged the need of a preliminary co-ordination among the Regulators of the countries involved in the MLs procedure.
Also, TSOs were generally reluctant in committing them in the MLs procedure, especially after the first publication of the EU Reg. 1228/03 [4], as they considered not convenient to start working on a process shortly expected to be modified.

- Neighbour TSOs participation to the process

Within the process, it was requested to each applicant to collect a series of certificates from the neighbouring TSOs. This documentation included a general consensus on the technical feasibility of the activities connected to the MLs projects and a positive opinion on the N-1 security of the neighbouring grid for the MLs operation. Most of the TSOs stated their unavailability to deliver all the requested certifications, if not directly involved in the security analyses. In particular, it was requested to start-up a close co-operation or a common working group with GRTN to assess jointly the TC. The criticalities of this proposal yet lied in what follows:

- Some of TSOs were participating in the procedure also as a part of applicant consortiums, with direct interests in the initiatives; a common table will have risked to deal with commercial negotiations and mutual vetoes, instead of security assessment
- Confidentiality restrictions existed for GRTN towards data of the delivered projects during the ongoing tender. The disclosure of technical information, necessary to perform joint security analyses, would have posed problems in handling confidentiality obligations, especially considering the direct interests above said.
- The timing of implementation of the AEEG procedures was not compliant with the establishment of a process of effective collaboration among all the TSOs

As allowed by the regulated path, GRTN proceeded to implement the procedures unilaterally, foreseeing a later involvement and confront with the neighbour TSOs.

[3] The law 290/03 had provided MAP as the authority to decide on the exemptions for interconnectors

4.3 Criticalities within security analyses running

It is worthwhile stating beforehand that, on November 19th, 2004, more than 30 projects were delivered. The phase of implementation of the security analyses have concerned most of them, so a huge number.

- Modelling MLs on power system simulator

It is easily understandable how much could be laborious and time-consuming the procedures for modelling each project on the simulator system. Furthermore, about the totality of the AC projects had envisaged the installation of FACTS devices, whose description and implementation on the simulator system inevitably introduce additional criticalities. Furthermore, some of the projects revealed a certain level of incompleteness and/or discrepancy within data for simulation. On external Commission's request, GRTN was then mandated to request the applicants, whereas needed, information/integrations of the delivered documentation, in order to pursue the principle of the maximum participation to the process. This process has obliged to suspend and start again the modelling phase for a significant number of projects.

- Procedures of TC assessment and calculations

Once the calculation phase started, criticalities mostly connected to the incremental capacity method arose up.

1. Inconsistencies of incremental capacity application

The literal application of the incremental capacity method determined unforeseen consequences during the implementation phase. In particular, it concerned the case of more MLs afferent to the same portion of grid and then creating congestion.

In fact, let's imagine three MLs projects having the same end-substations and calculate the three respective $TC^{(i)}$. Let's suppose that each of the three MLs could thermally transport 100 MW and that, from the calculation of the $TC^{(ALL)}$, each ML got 50 MW power flows in security conditions and so a 150 MW globally referable as a physical contribution of the three MLs to the global import. Well, let's suppose now to exclude the ML1 from the simulations and run the security analyses to assess $TC^{(ALL-1)}$. The 150 MW, flowing through the 3 MLs in the previous case, will now flow through the remaining 2 MLs, let's say 75 MW for each, <u>without determining any congestion at the same level of import</u>. Therefore, the $TC^{(ALL-1)}$ in this case would be equal to $TC^{(ALL)}$ and the $\Delta TC^{(1)} = 0$, and the ML1 would be assigned a zero capacity, as apparently not contributing to the global TC. The same would happen for the other MLs in this example. So, the literal application of the procedure would determine as a result the assignment of a zero TC to all the three MLs, although their contribution to the global $TC^{(ALL)}$ was reasonably existing and positive. The criticality described was overcome by the introduction of a preliminary selection, based on the qualitative ranking, as referred in 3.5.

2. Projects with other connected restructuring works

Some of the MLs projects presented, in addition to the realisation of the interconnector, projects of restructuring or upgrading of grid elements (lines, ATRs, substations), having direct impact on the operation of the interconnector itself[4]. The incremental capacity method envisaged including in the simulations (let's suppose the additional work consisted of an upgrade of an existing line L, close to the MLi target.):

- <u>the connected works proposed by all MLs,</u> during the assessment of global TC, where all MLs have to be considered simultaneously in operation (in the specific, the line L will be considered as upgraded).
- <u>only the connected works referred to the MLi</u>, during the assessments of single TCi, where only each MLi has to be considered (in the specific, the line L will be considered as upgraded only when calculating TCi, and not upgraded in all the other cases)

It implied first a significant increase of complexity of the dataset of simulation, since it was necessary to prearrange all the options for all the grid elements having connected works. Secondly, it implied deep attention in selecting, for each project, the correct package of connected works related and, conversely, in not considering them while performing analyses of TC related to different projects, so as not to give advantages to others from connected works proposed by an applicant. As a last consequence, while assessing TCi for MLi without connected works, the connected works of the other applicants had to be considered in the simulation; their presence, yet, would imply a benefit in the TCi assessed for MLi, even if it did not have connected works.

3. Simulated operation of DC and AC-FACTS links.

The DC links, as known, are normally operated by adjusting the amount of transiting power, by means of power electronics devices installed in the end-substations. So, these links can be considered as controlled in power. The same characteristics can be attributed also to the AC links managed via FACTS devices, which are supposed to keep constant power flow through it. The way to manage MLs of this kind arose, with particular reference to the simulation of the N-1 security on the whole interconnection. In fact, the strategy of selection of the several PSTs taps, could affect significantly the results of the TC assessment, first interest of the applicants, and needed an optimised solution.

It was decided to design and implement an ad-hoc Optimal Power Flow (OPF) function to manage the import via the DC and AC-FACTS links. This OPF had as a function objective the maximisation of the import while and the respect of both the range of DC/FACTS devices feasibility and the constraints set-up in N and N-1 security. It is worthwhile noting the high level of complexity of the calculation requested to the OPF function, working on the optimisation of a huge number of variables (DC, PSTs) and constraints to respect.

4. Insensitivity of incremental TC for ML<220 kV.

Several MLs lower than 220 kV applied for priority access. Considering the huge amount of import, the

[4] In most of cases, the additional works intended to relieve a congestion already expected from the involved ML; in others, they aimed simply at increasing the value of TC assignable to the ML in security.

impact on the whole Italian interconnection of a single ML, having voltage lower than 220 kV, was understandably limited. Therefore, during the application of the incremental capacity method, the TCi assessed without considering MLi in operation was the same of the case considering all MLs, that is zero incremental capacity for MLi. Actually, in most of cases, the non-consideration of single MLs<220 kV resulted only in a redistribution of flows on the other interconnectors without breaching the security criteria.

4.4 Criticalities of the technical compliance evaluation

Some difficulties were arisen for the projects envisaging the realization of new sections <220kV, belonging to the national transmission grid (RTN), into existing stations non-RTN. In these cases applicants envisaged a link between parts of RTN and parts non-RTN through a bus bar longitudinal link. This fact has determined the request of clarifications about the modality of links operation, since procedures allowed exclusively the realization of a direct link between two connection sites.

In some cases, the private investors, to respect a specific predetermined geographic path or to connect the ML forcedly to existing substations or lines, designed projects in a way at least "odd". Just to mention, some MLs envisaged three different voltage levels on the same interconnector, adjusted with PSTs and/or tap changer ATRs. Even if these solutions were not considered against technical compliance rules, however they can be reasonably defined as non-technically optimised solutions according to the usual technique of construction.

4.5 Criticalities of the multi-year assignment

As in 2.2, 151 envisaged the guarantee of a firm TC to the applicants, as priority access rights, for a period of 10 years, starting from the date of finalization of the MLs. This implied anyway a series of criticalities:

- The difficulty of the estimation of the power system conditions ten years in advance in a reliable way, even more with the pan-European market dynamics in place
- The impossibility to forecast the effective timing of realization of GRTN planned grid reinforcements and their impact on security while operating MLs.
- In some cases, the applicants committed their selves to make the ML available in advance with respect to the deadline of end 2007. On this respect, they claimed the right to use the capacity since the first day of ML operation. It meant for GRTN the need to run ad-hoc simulations for all the projects scheduled to enter into operation in advance and to define further a modulation of the assignment in accordance with the program of MLs entering into operation.

It was decided to undertake the process of implementation starting from evaluations on a reference year (2007), in order to work out a first set of outcomes. Later on, ad-hoc simulation at a shorter timeframe would have run depending on information on MLs realization.

5 CONCLUSIONS

The paper has provided a comprehensive overview of the process of implementation for handling MLs procedures, undertaken by GRTN to comply with the relevant ad-hoc regulatory framework. Details have been given on the criticalities encountered at all level and specifically about technical issues faced during the procedures of TC calculation and assignment. Overall considerations have been also posed to the attention of the reader.

A general lesson from the experience could be drawn in the severe difficulties that a TSO can tackle in reconciling the expectations from private investors, pursuing the maximization of the remuneration from investments, with the TSOs' mission to ensure network security while respecting principles of a fair and non-discrimination policy towards the priority access.

At the time being, the provisions of EU Reg.1228, in the way of gradual adoption by countries, will guarantee the constitution of a shared and harmonised legal and regulatory framework on all Congestion Management issues. Further, an EC document of "Guidelines on Congestion Management", explicitly treating also Merchant Links, is presently under discussion within the Florence Regulatory Forum and its principles will be adopted in the future by countries. Non-uniformity of treatment and lack of co-ordination between TSOs or national authorities of different countries must be therefore prevented.
Also, since for interconnectors "…exemptions will only be granted exceptionally and on a case-by-case basis and …there will be no block exemptions for specific types of infrastructures and all cases will be assessed on their merits…"[5], it is likely that a process of implementation with the complex characteristics described in the paper could be not repeated in the future in EU.

6 REFERENCES

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[2] "Procedura tecnica per la determinazione della capacità di trasporto per la quale è riconosciuto l'accesso a titolo prioritario sulla rete elettrica di interconnessione con l'estero", GRTN, 30/06/2003

[3] "Linee guida sulla documentazione tecnica da produrre in allegato alle richieste di interventi di sviluppo diretto", GRTN DRIPI02024

[4] Regulation 1228/2003 of the European Parliament and of the Council "on conditions for access to the network for cross-border exchanges in electricity", 26/06/2003

[5] "Exemptions from certain provisions of the third party access regime", DG TREN note on Directive 2003/54 and Regulation 1228/03, 30/01/2004