Council of
European
Energy
Regulators

CEER position paper

Inter-TSO Compensation Mechanism:
a model for the longer term

Introductory remarks

There is widespread agreement between the participants in the Florence Forum that transmission system operators shall receive compensation for costs incurred as a result of hosting cross border flows of electricity on their networks. At the 8th Forum meeting (February 2002) it was agreed to implement a temporary mechanism for arranging those compensations as of 01.03.2002. There was furthermore agreement on the basic principles and operational guidelines for a more cost reflective mechanism to enter into force in 2003. CEER presented workable solutions in order to come closer to cost-reflectiveness and ETSO was invited to do the necessary further analytical work and to put forward by 01.09 a concrete proposal for the 2003 system.

CEER has noted however that ETSO has not been able to come forward with a more comprehensive proposal that meets the requirements agreed upon in February. This indicates that under these circumstances an informal, voluntary agreement on the 2003 mechanism may not be possible.

This paper describes the main lines of a model that would fully meet the requirements of the Forum's last conclusions and is building upon the work that CEER has introduced so far[1]. This model for the 2003 mechanism, the "Florence-model", could then be incorporated as a guideline under art. 7 of the proposed Regulation of the European Parliament and of the Council on conditions for access to the network for cross border exchanges in electricity[2].

The Florence-model

The Florence-model for the Inter TSO Compensation Mechanism is based on the following elements and conditions:

- Transmission system operators shall receive compensations for costs incurred as a result of hosting all cross border flows of electricity on their network, not limited to transits.
- The amounts of cross border flows hosted and the amounts designated as originating and/or ending in national transmission systems shall be determined on the basis of real network models and flows.
- The methodology for the determination of the electrical use that is made of each individual TSO's network by network users outside this TSO's service area is applied on

[1] Reference is made of the conclusions of the 8th Florence-Forum and of the following CEER-document "A CEER agenda for discussing and solving cross border trade issues in electricity"

[2] COM(2002)304 final

the basis of verifiable and representative scenarios, using real time data. These data sets will be specified in more detail and will have to be made available by individual TSOs as an obligation under the Regulation.

- The methodology leads to the determination of external use factors, in an objective and transparent way.
- This is a 3 step approach, consisting of: (a) compensations due to each TSO, (b) charges that each TSO has to pay and (c) the net effect that has to be reflected in national transmission tariffs. Explicit determinations of the compensations, charges and net effects will have to be made.
- The costs incurred as a result of hosting cross border flows shall take into account the costs of energy losses and the costs of new and existing network assets.
- Standardised cost assessments, for the single purpose of this scheme only, shall be used, covering inter alia the cost of energy for losses, the cost of existing assets and the cost of new assets.
- There will be an ex post determination and allocation of the amounts to be compensated and charged under the scheme, together with its net impact on individual TSO's.
- There will be also an ex post verification of the translation of the net effect into national transmission tariffs.

The Florence-model further explained

A more detailed description of the model is annexed to this paper.

An important element in the model is the methodology for determining the external use factors, i.e. the electrical use that is made of each individual TSO's network by network users outside this TSO's service area. The preferential methodology for CEER is the methodology of Average Participations, although CEER accepts that other methodologies are possible as well. This is the classical average participations algorithm, which makes use of a simple heuristic rule to trace the source and the destination of the actual flow in each line of the system. This methodology is using data on real network flows, is well defined and developed and can be implemented at short notice, once the necessary data sets are made available by individual TSO's.

Preliminary quantitative estimations about the economic implications of the model indicate that:

- The economic value of the net inter-TSO payments because of losses are much lower (about one order of magnitude) than the net payments for infrastructure.
- The volume of net inter-TSO payments with this model may be lower (but of the same order of magnitude) than the one presently applied under the 2002 mechanism.
- Inter-TSO compensations are expected to have a low impact on the current transmission tariffs, where a predominant effect on the existing differences among them is the lack of regulatory harmonization[3].

[3] The average value of inter-TSO compensations (before netting them with charges) in the current 2002 mechanism is below 0.2 €/MWh, with only a couple of TSOs with values as high as 0.5 €/MWh and 1.8 €/MWh. On the other hand, transmission tariffs for a typical large consumer (demand of 15 MW from 8 am to 24 pm on week days, for instance) may range between 3.5 €/MWh and 14 €/MWh in the IEM, while the average integral tariff (where energy is included) for such a consumer in the IEM is in the vicinity of 45 €/MWh. These numbers are indicative of the low impact that is to be expected from the inter-TSO payment mechanism on the transmission tariffs as well as of the importance of harmonization of the current procedures of determination of these tariffs.

The Florence-model treats equally the existing transmission facilities and the future investments. This represents an evolution of the previous CEER position, which has been supporting the use of thresholds and the computation of the benefits associated to transits. This evolution has paralleled the gradual adoption of more objective and trustworthy methods to compute compensations and charges, so that the full impacts of network utilization are properly accounted for.

The Florence-model in its wider perspective

It is the general philosophy of CEER to issue regulatory guidelines or principles and to assess more detailed implementation schemes by ETSO and others on this basis. It is not the role of regulators to develop these schemes. However, it is felt that ETSO has not been able to fulfil this guideline implementation job in a timely and appropriate manner and voluntary solutions are therefore not feasible at the moment. Therefore CEER is reluctantly accepting that in this moment there is no alternative to the CEER presenting a concrete outline of the inter-TSO compensation mechanism and its more specific rules for implementation.

Furthermore, the Florence-model is addressed to provide a long-term solution to the issue of inter TSO payments compensations. This issue is just one among the several pieces of the puzzle of transmission regulation in the IEM context. Others being harmonisation of transmission tarification structures, congestion management, locational signals and the treatment of new investments.

The procedure for further implementation and verification

It is the perception of CEER that this model cannot be implemented as of 01.01.2003, but that some delay for technical preparations, such as starting an obligatory data collection process and the standardisation of the cost assessments, is not unreasonable.

If done on an ex post basis and if there is enough will, it should be possible for ETSO to have preliminary amounts of net compensations/charges calculated by the end of March which could be incorporated in national tariffs during the year 2003.

Moreover, ETSO should develop a more detailed plan for implementation by 01.04.2003, including the issues of accession countries and of DC-interconnected systems. In this respect, CEER would like to recall its February 2002 position on the participation of Switzerland and perimeter countries outside the IEM, notably that the application of the inter-TSO payment system to any country, inside or outside the IEM, is conditioned to its acceptance of the basic rules of transmission open access, as expressed in the EU Electricity Directive and to its real implementation in the national regulations with publicly available terms and conditions.

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Council of European Energy Regulators

Annex

The Florence-model

Introduction

The long-term mechanism starts from the local G and L charges that are determined by the different countries[4] for their generators and consumers, respectively, preferably subject to some harmonization criteria. The major task that the long-term mechanism has to address is the definition of a "satisfactory method" to determine the economic compensations that are due to a country, —and the corresponding charges to other countries—, because of the costs that are incurred by cross-border transactions and border flows. These costs have been already identified as being the costs derived from costs of losses and network utilization. It is accepted that the "electrical utilization" of a network by external agents is an acceptable measure of the costs of infrastructure that are born by this network because of cross-border transactions and loop flows. Once the compensation and the charges that correspond to any given country are computed, the results should be applied to modify the original G and L charges in some cost reflective, —and also preferably harmonized—, manner, so that the locational signals at country level are properly placed.

According to the cross-border tarification principles that have been adopted in Florence, the network cost allocation model must have the following basic features:

- For any given country j, the algorithm must be able to determine the fraction of network utilization and the fraction of losses that should be assigned to external use, that is, cross-border transactions and loop flows. This is the essential information to compute the compensation that is due to country j.
- The algorithm must also be able to assign the responsibility of the compensation of country *j* to all the remaining countries. This is the essential information to compute the charges for each one of the countries.
- The net results of the compensation and charges for any given country *j* should be transferred to the domestic transmission tariffs G and L, in a non transaction-based manner and in such a way that the locational effect of the inter-TSO payment mechanism is reasonably preserved.

The Florence-model consists of two parts. On one hand the algorithm that allocates the network infrastructure costs. On the other hand the method for allocation of network losses. Both schemes are based on the same underlying philosophy.

The algorithm for allocation of infrastructure network costs

The underlying philosophy

The simple and brute force idea behind the Florence-model is to start from the description of the actual electricity flows in the Internal Electricity Market (IEM) network for a specific scenario (i.e. operating condition) and to assign the utilization of every transmission line in each one of the 17 countries of the IEM to the users located in the different nodes, -which

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[4] The terms "country" and "TSO" are used indistinctly here.

typically will not be too far away from the considered facility-, although this obviously depends on the prevalent flow patterns, see Figure 1. The exercise will have to be repeated for the set of scenarios that can be considered to reasonably represent the IEM network utilization during the considered time period (typically one year).

Figure 1. Allocation of the use of a transmission line[5]

Let us assume that a method for the assessment of costs of all transmission lines within the IEM has been harmonized, so that all Member States agree on the regulated annual cost of each one of the lines and other transmission facilities, at least for the purpose of this compensation mechanism. The procedure above, if applied to the entire network of the 17 IEM countries, ignoring political borders, would provide individual transmission tariffs for the users in every node of this network. That would result in an IEM global transmission tarification mechanism, and one which provides complete locational signals, but it can be also used to determine inter-TSO payments.

How can we use the results of the algorithm in the context of the inter-TSO payment mechanism, as described above? It is very simple. Assume that a country *M* has 600 lines, that 80% of the use of line 1 of country *M* has been allocated by the algorithm to nodes within country *M*, 15% to nodes in country *N* and 5% to nodes in country *P*. Same thing with line 2, with different percentages, and then with line 3, line 4 and so on, until all 600 lines have been accounted for. It is then immediate to compute the fraction of the entire network of country *M* that is used by its local users and how much is used by users in country *N*, country *P* and so on[6]. Therefore, the algorithm computes a 'share-of-network-use factor' for each node and then, by aggregation, also for each country. When the usage factors are applied to the costs of the individual lines, -which have been determined by some agreed procedure as indicated above-, then we automatically obtain the total economic compensation that is owed to country *M* and also how much of it must be paid by country *N*, country *P* and so on.

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[5] This is a symbolic representation that does not correspond to any actual line

[6] It would not be correct to give the same weight to all lines, regardless of their voltage and length. The best weighing factor for the computation of inter-TSO payments is the individual standardized cost of each line.

This algorithm determines the fraction of a network that needs to be compensated by external users, but at the same time it also computes how to charge this compensation to every external country. Therefore there is no need to design a new allocation algorithm to determine the charges. Compensations and charges are computed by the same algorithm.

The method of average participations (AP)

The basic intuition behind the average participations method is that the sources of the supply to loads and the destination of the power injected by generators, as well as the responsibility for causing the flows in all lines, can be assigned by employing very simple heuristic rules that only make use of the actual pattern of network flows. The method requires as its basic input data a complete snapshot of the network power flows corresponding to the specific system conditions of interest. It is a well-known method that has been already used in several countries many years ago.

The algorithm is based on the assumption that electricity flows can be traced —or the responsibilities for causing them can be assigned— by supposing that, at any network node, the inflows are distributed proportionally between the outflows. It is inherently an average factor method. Under these assumptions, the method *traces* the flow of electricity from individual sources to individual sinks; i.e., the model identifies, for each generator injecting power into the network, physical paths starting at the generator that extend into the grid until they reach certain loads where they end. Symmetrically, the paths from loads to generators can also be found, yielding exactly the same results of allocation of responsibility of flows to generators and loads. Then, the cost of each line is allocated to the different users according to how much the flows starting at a certain agent have circulated along the corresponding line.

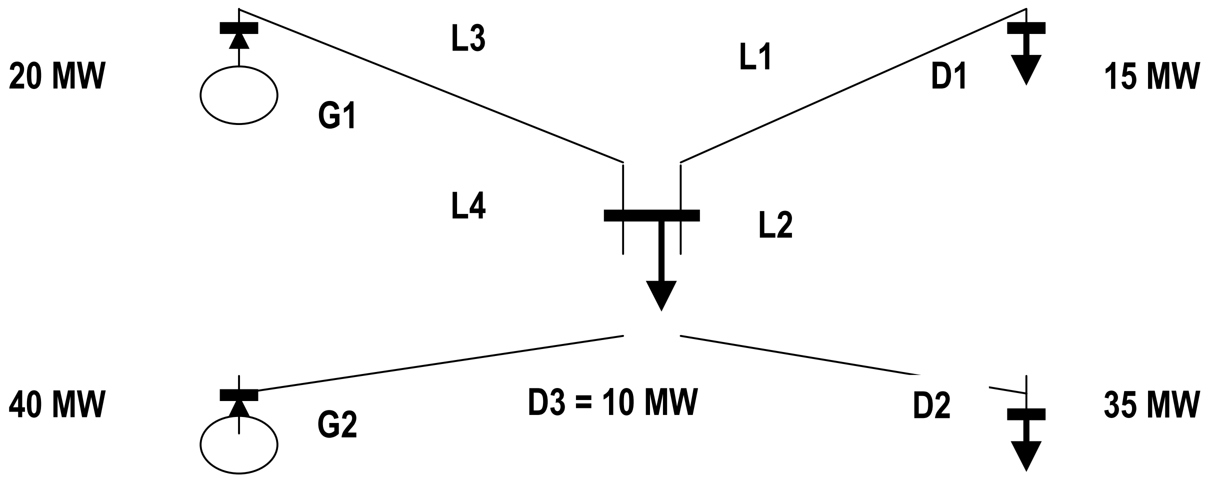

Figure 1. Proportionality principle in average participations

This is how the method works: for every individual generator *i*, a number of physical paths are constructed, starting at the node where the producer injects the power into the grid, following through the lines as the power spills over the network, and finally reaching several of the loads in the system. An analogous calculation is also performed for the demands, tracing upstream the energy consumed by a certain user, from the demand bus until some generators are reached. One such physical path (with as many branches as needed) is constructed for every producer, and for every demand. In order to create these paths, a basic criteria is adopted: in each node of the network, the inflows are allocated proportionally to the outflows. This makes the method easier to implement. A simple example is shown in Figure 1.

According to the proportional distribution rule, generator G1 would contribute 15x20/(20+40) MW to the flow in line 1, 35x20/(20+40) MW to the flow in line 2, as well as the total of 20 MW in line 3 and nothing in line 4. Similarly, demand D2 would contribute 20x35/(10+15+35) to the flow in line 3, 40x35/(10+15+35) to the flow in line l4, all the 35 MW inline 2 and nothing in line 1. The demand D3 of 10 MW has a contribution of 20x10/(10+15+35) to the flow in line 3, 40x10/(10+15+35) to the flow in line 4 and no contribution to the flows in lines 1 and 2.

The participation of agent *i* in line *j* is obtained as the part of the flows starting at agent *i* that pass through line *j.* The method implicitly results in a 50/50 global allocation of costs to generators and demands. However, if desired, an *ad hoc* weighting factor could be used to modify this percentage. This facilitates the implementation of any G/L allocation rule that may be decided by regulators to ensure the consistency of the entire network tarification system.

This flexibility in the split of the costs to generators and loads can also be used to address a different issue. It may be decided to apply the AP algorithm only to the allocation of the fraction of the transmission facilities that is actually in use in the considered scenario (e.g. a line with a capacity of 1,000 MW may have an actual flow of only 300 MW in a given scenario; then, for this scenario, only 30% of the cost of the line would be allocated by the AP algorithm). The remaining part could be allocated in a different way, perhaps allowing more flexibility in tariff harmonization guidelines[7]. This idea makes particular sense when one thinks of lightly loaded lines that have mainly a reliability purpose and whose cost should be widely distributed among the network users.

The results for compensations and charges.

A sample of the kind of results that can be obtained by application of the model will be presented next. The model has been applied to a single scenario of the UCTE network, comprising 17 countries in continental Europe [8]. Aggregated information on the chosen scenario is presented in Table 1, where #D and #G stand for number of demand nodes and generation nodes, respectively, and ETSO-T corresponds to the definition of transit that has been adopted by ETSO.

[7] For instance, the non used part could be socialized to all consumers in the country or TSO where the transmission facility is located.

[8] In the table E stands for Spain, P for Portugal, F for France, I for Italy, CH for Switzerland, D for Germany, B for Belgium, NL for The Netherlands, SLO for Slovenia, A for Austria, CZ for the Czech Republic, PL for Poland, BIH for Bosnia, HR for Croatia, H for Hungary, SK for the Slovak Republic and UA for Ukraine.

Country	Name	Demand	Generation	#D	#G	Exports	Imports	Net E-I	ETSO-T
E	*Spain*	29,090	28,289	197	103	554	1,851	-1,298	554
P	*Portugal*	6,364	6,891	35	20	755	361	395	361
F	*France*	64,804	74,126	677	184	8,487	193	8,293	193
I	*Italy*	31,480	26,508	217	112	0	5,321	-5,321	0
CH	*Switzerland*	5,720	5,877	53	37	2,686	2,604	82	2,604
D	*Germany*	50,150	49,649	367	93	3,887	5,042	-1,155	3,887
B	*Belgium*	7,170	6,405	31	12	1,053	1,752	-699	1,053
NL	*Netherlands*	10,651	7,134	34	14	325	3,923	-3,597	325
SLO	*Slovenia*	820	929	4	3	814	764	50	764
A	*Austria*	2,814	3,905	20	20	1,961	577	1,385	577
CZ	*Czech Rep.*	8,194	9,836	32	16	2,099	791	1,308	791
PL	*Poland*	15,449	16,032	106	29	843	235	608	235
BIH	*Bosnia*	316	671	6	7	146	146	0	146
HR	*Croatia*	995	1,122	7	7	733	684	50	684
H	*Hungary*	4,146	3,619	24	7	373	725	-352	373
SK	*Slovak Rep.*	2,616	2,759	24	10	569	567	3	567
UA	*Ukraine*	84	250	1	1	279	29	250	29

Data in MW

Table 1: Aggregated data for the considered UCTE scenario

Table 2 presents the compensations and charges for each one of the considered countries. These numbers correspond to only one set of operating conditions (one scenario) and therefore should not be taken as representative of the actual values of the compensations and charges for any given year. Note that the import and export patterns, -which are critical in determining the inter-TSO compensations-, may change much during the year. It follows the explanation of the elements of Table 2.

	E	P	F	I	CH	D	B	NL	SLO	A	CZ	PL	BIH	HR	H	SK	UA		
E	10.43	0.11	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.73	0.30
P	0.19	2.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.19
F	0.16	0.00	29.26	0.40	0.33	0.45	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.74	1.48
I	0.00	0.00	0.34	11.29	0.49	0.01	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.10	0.01	0.00	0.00	12.31	1.02
CH	0.00	0.00	0.15	0.24	2.60	0.19	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	0.60
D	0.00	0.00	0.04	0.00	0.22	22.46	0.01	0.30	0.00	0.20	0.08	0.09	0.00	0.00	0.00	0.00	0.00	23.40	0.94
B	0.00	0.00	0.15	0.00	0.00	0.01	2.06	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	0.24
NL	0.00	0.00	0.00	0.00	0.00	0.23	0.08	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.89	0.31
SLO	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.22	0.06	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.31	0.10
A	0.00	0.00	0.00	0.04	0.06	0.16	0.00	0.00	0.03	1.15	0.02	0.00	0.00	0.00	0.02	0.01	0.00	1.49	0.35
CZ	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.07	1.28	0.04	0.00	0.00	0.00	0.06	0.00	1.71	0.43
PL	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.07	6.54	0.00	0.00	0.00	0.04	0.00	6.70	0.16
BIH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.02	0.00	0.00	0.00	0.23	0.02
HR	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.08	0.28	0.02	0.00	0.00	0.47	0.20
H	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	1.00	0.07	0.02	1.13	0.13
SK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.00	0.00	0.05	0.95	0.01	1.10	0.15
UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.01	0.08	0.06
	10.78	2.12	30.13	12.02	3.71	23.80	2.28	1.96	0.33	1.58	1.48	6.72	0.29	0.44	1.13	1.17	0.05		
	10.73	2.20	30.74	12.31	3.20	23.40	2.30	1.89	0.31	1.49	1.71	6.70	0.23	0.47	1.13	1.10	0.08		
	0.05	-0.08	-0.61	-0.29	0.51	0.40	-0.02	0.07	0.01	0.09	-0.22	0.02	0.06	-0.04	0.01	0.07	-0.03		
	0.35	0.11	0.87	0.73	1.11	1.34	0.22	0.39	0.11	0.44	0.21	0.18	0.08	0.16	0.13	0.22	0.03		
	0.30	0.19	1.48	1.02	0.60	0.94	0.24	0.31	0.10	0.35	0.43	0.16	0.02	0.20	0.13	0.15	0.06		

Table 2: Case example of average participations of network use.

All numbers in the table are percentages of the total equivalent number of lines of 400 kV in the considered UCTE network. For instance, 10.43 means 10.43% of the total number of lines in the considered model[9]. If the numbers in any given column, for instance column *F* for France, are considered:

- 0.34 is the external use made by I (Italy) of the French network.
- 29.26 is France's own utilization of its network.
- 30.13 is the total use of the French network (both by France itself and by others), i.e. the total volume of lines in the French network, and it is equal to the sum of all numbers in the column above.

Consider now the numbers in row F, again for France:

- 0.33 is how much France uses the Swiss network.
- 30.74 is the total use of France of the European network, including the French network, and it is equal to the sum of all numbers in the row to the left. This number 30.74 has been repeated below 30.13 in column F.
- The difference between the two aggregate numbers: 30.13 – 30.74 = -0.61, is the inter-TSO payment for France. As it is negative, France has to pay. This means that France uses other external networks more than other countries use the French network.

There are also other numbers of interest in column F, for France:

- The number 0.87 in column *F* is the sum of all external utilizations of the French network by others (0.19 by Spain, 0.34 by Italy, 0.15 by Switzerland, 0.04 by Germany and 0.15 by Belgium), excluding France's own use.
- Similarly, the number 1.48 in column *F* is a replica of the leftmost number in row F. This is the sum of all external utilizations that France makes of external networks (0.16 of Spain, 0.40 of Italy. 0.33 of Switzerland, 0.45 of Germany and 0.13 of Belgium).
- It should be clear by now that the difference between these two numbers: 0.87 – 1.48 also equals the inter-TSO payment for France: -0.61.

The numbers in Table 2 appear to make engineering and economic sense. An almost purely exporting country in this scenario, such as France with 8,487 MW of exports and 193 MW of imports, participates in the utilization of the networks of neighbouring countries, such as Spain (0.16), Italy (0.40), Switzerland (0.33), Germany (0.45) and Belgium (0.13). On the other hand, several importing countries use the French network, such as Spain (0.19), Italy (0.34), Switzerland (0.15)Germany (0.04) and Belgium (0.15), yielding a total compensation to France because of the external utilization of its network of 0.87. Since the global utilization by France of other networks equals 1.48, the net inter-TSO payment for France is –0.61. Since this is a negative number, this means that French network users owe 0.61% of the total number of lines in the UCTE model to a common fund to compensate other countries for the external utilization of their networks. Of course, this is just one winter peak load scenario and the final numbers could be quite different once a representative number of scenarios are evaluated.

A similar interpretation can be given when the figures for a purely importing country in this scenario, such as Italy with no exports and 5,321 MW of imports, are examined. Italy also has to face a net payment of 0,29. The situation is quite different for an almost purely transited country in this scenario, such as Switzerland, with 2,686 MW of exports and 2,604

[9] The model has more than 3500 lines. The reason for this peculiar way of presenting the results is that the length of each line was not available as an input data. Therefore, all lines have been assumed to have equal length and some standard equivalence factors have been employed so that 400 kV lines, 220 kV lines and transformers could be jointly considered. One 220 kV line equals 0.66 equivalent 400 kV lines, one 132 kV line equals 0.44 equivalent 400 kV lines and transformers have been sometimes considered as equivalent to 400 kV lines, or to 220 or even 132 kV lines.

MW of imports[10]. Although Switzerland has to compensate other countries for a total amount of 0.60, it must be compensated by a total of 1,11, therefore resulting in a positive net payment of 0.51. This is also the case for other almost purely transited countries in this scenario, such as Slovenia, Bosnia and the Slovak Republic, although Croatia has to pay (it has a slightly net exporting balance). Other cases are a mixture of exports, imports and transits and they are more difficult to assess.

Critical evaluation

It is not claimed here that the Florence-model is the only reasonable method that is currently available or that it does not admit improvements. But it appears to be the most suitable approach that is presently available for the longer-term mechanism[11].

No known method can claim that is able to trace the actual flows of power in an electric network. The AP approach can only offer a heuristic procedure that is simple and that appears to make good economic and physical sense.

A potential criticism has been raised by ETSO with respect to the AP method: Small and heavily transited countries that are well balanced in generation and demand may appear to make an excessive use of other countries' networks and end up with small or even negative net inter-TSO payments. This may happen, although it has not been the case in the scenario that has been examined in this study. But there is nothing wrong conceptually about it, since it is not "transits" but "total flows" what has to be considered in the cost allocation analysis and network utilization has to be determined without regard to political borders.

Based on the preliminary numerical results that have been obtained, the volume of TSO-payments that result from the Florence-model appear to be reasonable and do not exceed the values in the 2002 provisional mechanism.

The algorithm for allocation of the costs of network losses

The same algorithm of average participations can be used to determine the share of the losses associated to the flows in the lines. The computation is a by-product of the results that are provided by the AP method and it therefore results in average (and not marginal) participation factors for losses. Once the AP method has allocated the flow of a line to a subset of the IEM network users, the same allocation factors can be employed to assign the losses in the line. In this way it is straightforward to allocate the losses in all the lines of a given country j to the network users in country j and to the network users in other countries. Compensation and charges are therefore determined with the same algorithm.

Under a quantitative viewpoint the inter-TSO compensations that are due to losses are about one order of magnitude inferior to the compensations corresponding to network infrastructure costs.

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[10] One must remember that the longer term inter-TSO payment mechanism should be applied regardless the actual commercial transactions taking place in the IEM.

[11] A recent study for the European Commission has evaluated several alternative approaches and it concludes recommending the average participations method, although other alternatives exist. See "Cost components of cross-border exchanges of electricity", prepared for the DG TREN of the European Commission by the Institute of Technological Research (IIT) at Comillas University of Madrid.