



REPORT

CONFIDENTIAL

APPROVED

VERSION 1.0

INTERCONNECTION GRID CODE FOR THE PAN ARAB ELECTRICITY MARKET

SCHEDULING AND DISPATCHING CODE

Arab Fund Grant Number 06/2018

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SDC 1 SCOPE OF APPLICATION

J.¹ The scope of application is to provide elements for a proper understanding of the provisions.

SDC 1.1.1 Chapter SDC 1 of this **Code** concerns roles, rights, obligations and responsibility of all the **Parties** regarding the **Energy Transfer on International Interconnections**.

SDC 1.1.2 The process for the joint determination of the **Total Transfer Capacity (TTC)** and the **Net Transfer Capacity (NTC)** on yearly, monthly and daily bases is regulated. This process is mandatory for all **TSOs** and coordinated by the **Arab TSOs Committee**.

SDC 1.1.3 This joint assessment is carried out based on load flow studies considering the characteristics of all the **International Interconnections**, including, if present, **Reserved Transmission Capacities** and **Merchant Lines**, the expected load demand and the planned maintenance on the interconnected **Electricity Systems**.

SDC 1.1.4 **Congestion management on the International Interconnections of the PAEM Electricity System** takes place through joint allocation via explicit **Auctions** of the capacity in form of yearly, monthly and daily **Long-Term Transmission Rights** carried out by the **Regional Market Facilitator** on behalf of the relevant **TSOs**, but in its own name according to the **Auction Specifications and** rules.

SDC 1.1.5 Moreover, the process of joint curtailment is regulated to pursue secure system operation. It concerns the reduction of the **TTC/NTC** caused by unavailability of **Transmission System** and/or some critical conditions during certain periods of the year.

SDC 1.1.6 The process of capacity allocation by **Auction** is not mandatory but represents a guideline on the development of the electricity market in **PAEM**.

SDC 1.1.7 The task of scheduling cross-border **Energy Transfer** is performed during the scheduling phase (day ahead) and during the real-time phase (**Actual Energy Transfer** definition). It aims at guaranteeing agreed **Scheduled Energy Transfer** among all **TSOs**, in execution of bilateral agreements.

¹ J. : Justification

SDC 1.1.8 During the electricity market resolution, the **Bilateral Contracts** are treated in the market according to the procedures set by the **National Regulator**.

SDC 1.1.9 Finally, real-time monitoring of the **PAEM Electricity System** is performed in order to evaluate the secure operation criteria, to coordinate the compliance of the **Electricity System** after any event, and to account for and settle unintentional deviations.

SDC 1.1.10 All times mentioned in this document are related to GMT+2.



SDC 2 TRANSFER CAPACITY MANAGEMENT PROCESS

J. Common procedures for managing the **Transfer Capacity** are required among the involved **TSOs**. This contributes to system access in a transparent and non-discriminatory manner for allocation of the cross-border capacity.

SDC 2.1.1 The management process of the **Transfer Capacity** is based on rules that define the concrete methodology for calculating capacity up to a year ahead and referred to as long-term capacity calculation. The objective of defining long term capacity is twofold. Firstly, **Registered Participants** look to forecast future day ahead pricing in the different **Bidding Zones** as an input to developing strategies for operation and investment decisions. The goal of long-term capacity calculation is to provide **Registered Participants** with the information about expected capacity between **Bidding Zones**, as will have an impact on demand and supply of electricity and hence on the day ahead pricing. Secondly, the calculation of long-term capacity will act as input to the issuing of **Long-Term Transmission Rights** on the borders of the **Bidding Zones**. Thus, the calculation of long-term capacity will also provide capacity for hedging purposes.

SDC 2.1.2 This process shall be coordinated by the **Arab TSOs Committee**.

SDC 2.2 Calculation of NTC on the Pan Arab Interconnection System Joint Procedure

SDC 2.2.1 *General Guidelines*

J. Establish common procedure for **NTC** calculation

SDC 2.2.2 **NTC** and **TTC** assessments are performed through load flow calculations.

SDC 2.2.3 The main prerequisites are:

- a) A suitable **Grid Model** that allows determining the influences of neighboring areas.
- b) Estimated generation and load patterns to simulate cross-border **Energy Transfer (Base Case)**.
- c) A procedure to harmonize and agree on the input data among the concerned **TSOs**.
- d) Guidelines to perform the simulations of cross-border **Energy Transfer** in a most realistic and understandable way.

SDC 2.2.4 The responsibilities for the assessment of the **TTC/NTC** fall on **TSOs**. According to **National Grid Codes** or to national regulatory frameworks, **TSOs** are bound legally to operate the **Grid**, always respecting operational security, while monitoring the condition of its **Grid** and managing congestion.

SDC 2.2.5 Therefore, the subsidiarity principle is applied in steps during the **TTC/NTC** assessment process.

SDC 2.2.6 Each concerned **TSO** is thus responsible to provide the necessary input data for the load flow calculations for its **Transmission System**:

- a) Relevant **Grid Model** and topology.
- b) Technical data of the **Transmission System**.
- c) Estimated generation and load patterns.
- d) Technical and operational limits.

SDC 2.2.7 The capacity assessments are based on common sets of data to form a commonly agreed **Base Case**.

SDC 2.2.8 **PAEM** shall issue at least twice a year a **PAEM Electricity System** load flow forecast for winter and summer peak hours. Additional **Snapshots** of load flow situations may be provided if requested. In order to reach an adequate level of consistency and harmonization, the **Arab TSOs Committee** will provide interconnected **Network Base Cases**.

SDC 2.2.9 The **TSOs** will treat all data as confidential. The assessment procedure shall guarantee that each **NTC** value is reachable without compromising the security of the **PAEM Electricity System**.

SDC 2.2.10 The **TTC/NTC** are performed for each pair of electrically adjacent countries. In case of strong interdependencies among different groups of **Member States** (zones), calculation of **TTC/NTC** between these zones and the neighboring countries will be performed.

SDC 2.2.11 *Base Case Construction*

J. The **TTC/NTC calculations require a set of data common to all **Member States**.**

SDC 2.2.12 This set of data comprising the **Base Case** includes a **Grid Model** and input data describing load and generation patterns forecast, along with **Network** topology for the study time frame (yearly, monthly and daily).

SDC 2.2.13 The **TSOs** shall provide the harmonization of the **TSO's** individual inputs in order to set up the common data sets efficiently.

SDC 2.2.13.1 Grid Model

J. Common procedure to define the common **Grid Model to use in the calculation.**

SDC 2.2.13.1.1 The **Grid Model** should contain, as possible, a full representation of the elements of the **Grid** of each **Member State**, including the **Member States** connected by **HVDC Systems**. The study area shall be as wide as possible to provide an accurate understanding of the distribution of physical flows on tie-lines resulting from international **Energy Transfers** recognizing that some portion of power flowing from one area to another can circulate through third countries depending on the **International Interconnection**.

SDC 2.2.13.1.2 The effect of **HVDC Systems** between areas is represented through injection or sinks at the relevant nodes.

SDC 2.2.13.1.3 The calculation area for **NTC** assessment between two neighboring **Member States** will be determined case by case following the above principles and could involve just a subset of the full **Grid Model**. Each partner can ask for an extension of the calculation area if necessary.

SDC 2.2.13.2 Input Data

J. Input data needed to perform the capacity assessment.

SDC 2.2.13.2.1 Load flow calculation shall to be performed using an AC load flow model.

SDC 2.2.13.2.2 **TTC/NTC** assessment for each time frame being considered requires the following:

- a) The thermal ratings of the elements of the **Transmission System** as well as the electrical parameters. Thermal rating shall be addressed in Amps and in MW, considering a predefined $\cos\theta$ and nominal voltage. According to the time frame studied, the corresponding seasonal values of thermal ratings shall be used.
- b) The maximum and minimum active and reactive power output for the **Power-Generating Facilities** units included in the **Grid Model**.
- c) The expected **Grid** topology at the time frame considered.

- d) The generation pattern by the means of the injection at each node at the time frame considered.
- e) The load pattern by the means of the net sink at each node at the time frame considered.
- f) The common set of programs of cross-border transaction and the net balances of each **TSO Control Area** at the time frame considered.
- g) The common set of cross-border transaction considered in the **Base Case** relates to the best forecast for **the Energy Transfer** at the time frame considered.
- h) The expected maximum power generation available at the time frame considered.

SDC 2.2.13.2.3 Each **TSO** commits itself to provide the best estimated available input data for its own **Control Area**, reflecting as much as possible realistic scenarios, previously agreed within its country or with reference to the historical data,

SDC 2.2.13.2.4 The **Base Case** can be developed for:

- a) Real observed operation situations.
- b) Forecast conditions.

SDC 2.2.13.2.5 While the observed operation situations offer a true scenario of the behavior of the **Electricity System**, forecast can sometimes provide a better baseline because it would include the expertise of each **TSO** about the expected behavior of generation and load in its own country and knowledge about the scheduled maintenance works on the **Integrated Power System** and the **Facilities**. These two alternative views on **Base Case** construction could also be combined. The **Base Case** would be starting from a real observed situation (**Snapshot** of the **Electricity System** at selected scenarios) then modified by each **TSO** with updated information regarding its system considering foreseeable differences due to:

- a) Load level, according to the **Demand Forecasts** over the time frame being analyzed.
- b) **Generation** pattern based on forecasts of primary energy sources (e.g. hydro reserves, fuel availability).
- c) **Grid** and generation **Planned** or **Forced Outages** (long lasting).

SDC 2.2.13.2.6 No definite rules need to be established to perform these tasks, but it is assumed they would be carried out according to the **Good Utility Practice** of each **TSO**. The specific procedure that each **TSO** uses to modify the starting **Base Case** must utilize modifications that are consistent with real generation limits/possibilities and **the Energy Transfer** on the interconnection tie-line. Each **TSO** must explain the nature and extent of

any modification performed on starting **Base Case** and shall communicate the rationale when sending to other partners.

SDC 2.2.14 Guidelines for Load Flow Calculation

SDC 2.2.14.1 Cross-border Exchange Simulation

J. A common methodology to establish the **TTC/NTC** limits is critical for maintaining system security.

SDC 2.2.14.1.1 In order to determine the cross-border transaction limit between two neighboring **Member States**, cross-border **Energy Transfers** are gradually increased while maintaining the load in the whole system unchanged until security limits are reached.

SDC 2.2.14.1.2 Starting from common **Base Case Energy Transfer**, the additional **Energy Transfer** is performed through an increase of generation on the exporting side and an equivalent decrease of generation on the importing side. This generation shift is to be made stepwise until a **Grid** constraint is violated.

SDC 2.2.14.1.3 The generation increase/decrease shall be performed according to some predefined criteria. The general criteria as well as any exceptions are to be defined by the **TSOs** involved in the calculation of a given **TTC/NTC**. Some possible ways to distribute generation increase/decrease in a given **Electricity System** of a **Member State** over the different generating sets in this area are the following:

- a) Proportional increase/decrease: for example, the factor which distributes the generation increase/decrease in a given **Electricity System** of a **Member State** over different **Power-Generating Facilities** in this area could be the ratio of **Base Case** schedule of each **Power-Generating Facility** to the total of internal generation scheduled and involved in the shift.
- b) Increase/decrease according the previously observed behavior of the **Power-Generating Facilities**. For example, the factor which distributes the generation increase/decrease in a given country could consider the usual response pattern of generation to different system loads.
- c) Increase/decrease according to a well-known merit order: whenever economic dispatch is applied the increase/decrease of generation shall be applied according the merit order.

SDC 2.2.14.1.4 The shift is to be performed considering the technical operation constraints of each **Power-Generating Module** and its technical limits (maximum/minimum power, optimal use of a power plant, water or fuel available).

SDC 2.2.14.1.5 The choice among different shift possibilities or even a combination of shifting strategies is left to the responsibility of each **TSO** but shall be explained and communicated to the other **TSOs** involved in computing a given **TTC/NTC**.

SDC 2.2.14.1.6 The **Party** who is making the calculation is responsible at a minimum for the contingency analysis in its **Transmission System** and cross-border tie lines including some well-known contingencies in the neighboring **Electricity System** which influence the security of its own **Electricity System**.

SDC 2.2.14.2 Limitation Due to Security Constraints

J. Identification of specific constraints that limit the **TTC/NTC of an **Electricity System**.**

SDC 2.2.14.2.1 The **Energy Transfer** increase/decrease goes on until security rules are violated in the **Grid** and the interconnection tie-lines of the **TSO** performing the calculation, or inside another **Electricity System** of a **Member State** with respect to thermal ratings of elements of the **Transmission System**. Security problems can result in thermal, voltage, stability limitations that are to be defined by the country which performs the calculation and shall be coherent with the rules published in its **National Grid Code**.

SDC 2.2.14.2.2 If the constraint occurs within the country that runs the calculation, it first shall be determined if the congestion could be relieved by corrective measures without reducing the security level of the **Electricity System**. If the constraint remains, then the limit becomes directly effective.

SDC 2.2.14.2.3 If the constraint occurs in another **Electricity System** of a **Member State**, its impact shall be confirmed by the relevant **TSO** of the **Grid** where the congestion takes place, before the limit is considered as effective. Thus, the **TSO** running calculation shall:

- a) Notify involved **TSO**.
- b) Discuss the physical reality of this constraint.
- c) Consider the constraint in the security analysis only if the involved **TSO** concurs.

SDC 2.2.14.2.4 Therefore, to have an **NTC** value limited by a security constraint within another **TSO's Grid** implies an explicit agreement with the other **TSO** on

the reality of this constraint. Once all constraints are recognized by both the neighboring TSOs, they shall be considered binding.

SDC 2.2.14.2.5 The last value of additional **Energy Transfer** which does not involve any security problem forms the value ΔE . It represents the extra amount of power over the **Base Case** that can be exchanged continuously from one **Electricity System** of a **Member State** to another while ensuring the safe operation of both interconnected **Electricity System**. This value, added to the initial transaction value (**BCE: Base Case Exchange**), gives the **Total Transfer Capacity (TTC)** between these countries:

$$TTC = BCE + \Delta E = NTC + TRM$$

Where:

- a) **TRM** is the **Transmission Reliability Margin** defined in the Article SDC 2.2.15.
- b) **NTC** is the **Net Transfer Capacity**.

SDC 2.2.14.2.6 If the physical generation shift between the two concerned **Electricity Systems** according to their actual available generation is reached and no security rules are violated, no realistic limitation on the **TTC/NTC** for the **Base Case** is found. In this case, the **NTC** between these two **Electricity Systems** would equal the shift of all available generation.

SDC 2.2.15 *Transmission Reliability Margin*

J. A common procedure for evaluating **TRM** is critical for security of the interconnected **Transmission System**.

SDC 2.2.15.1 Some margin in the **TTC**, related to the deviations occurring both in real-time operations and in the capacity assessment process, must be maintained.

SDC 2.2.15.2 This capacity refers particularly to the unintended deviations due to the power-frequency (secondary) control and primary frequency control, needs for common reserve, and emergency **Energy Transfer** to cope with unbalance situations. These sources of uncertainty are used to calculate the **TRM** factor for a given direction of transfer. Each **TSO** calculates its own **TRM** values according to requirements for ensuring the operational security of its **Grid**.

SDC 2.2.15.3 Finally, each pair of neighboring **Member States** should agree on a unique value of **TRM** for a given direction of transfer. In case of disagreement, each

TSO will maintain its final value of **TRM** in operations according to the need of its own **Electricity System** for which it is the solely responsible.

SDC 2.2.15.4 **TRM** is determined by unintended load-frequency regulation deviations and needs for common reserve and emergency **Energy Transfer**.

SDC 2.2.15.5 Load-frequency control margin can be estimated through statistical analysis of past data using the estimated variance of deviation of historical series for one or more years. These time series shall be previously filtered to avoid the bias which may be introduced by large deviations, occurring as the result of sudden load imbalances (like the one induced by generator trips), that must be considered in the emergency **Energy Transfer**.

SDC 2.2.15.6 As far as common reserve and emergency **Energy Transfer** are concerned, their amount is to be evaluated and agreed by the involved countries.

SDC 2.2.15.7 In any case the value of **TRM** should be decided by each TSO taking into account its regulation capacity and the interconnection security.

SDC 2.2.16 *Uncertainties in TTC Calculation*

J. The process of **TTC** calculation could be affected by physical model inaccuracies and unintended deviation of physical flows. Additional margin may need to be considered.

SDC 2.2.16.1 Uncertainties regarding the **Base Case Energy Transfer**, which means uncertainties on a scenario about the expected behavior of market participant, may translate into more substantial uncertainties about **TTC/NTC**. The assessments of **TTC** and **NTC** are based on calculations that consider specific assumptions regarding **Base Case Energy Transfer**. Uncertainties in **Base Case** scenarios may be considered when allocating **NTC** in different time frames. Separately from the assessment of the **NTC/TTC** and the calculation of the transmission reliability margin **TRM**, **TSOs** may decide whether additional margin shall be considered, in case of strong uncertainties in generation scenarios.

SDC 2.2.16.2 In a yearly planning procedure, the uncertainties on the scenarios may be quite substantial allowing only a partial allocation of **NTC** in advance. When getting closer to the operating horizon, these uncertainties may diminish such that further portions of **TTC/NTC** may be allocated to market participants. Moreover, subsequent calculation of **TTC** and **NTC** at different time frames (yearly, monthly, day ahead) will be necessary to allocate for each condition the maximum value of **TTC**.

SDC 2.2.17 Treatment of Different Results Among TSOs

J. Agreement between TSOs that use different security criteria is necessary for coordinated operations

SDC 2.2.17.1 The N-1 security deterministic criterion to perform the contingency effects assessment is recommended.

SDC 2.2.17.2 In the case that **National Grid Code** and/or additional guidelines issued by national authorities or regulators oblige **TSOs** to different security criteria, the concerned **TSOs** will need to apply them. Reconciling conflicts which arise will be based on the principle of subsidiarity.

SDC 2.2.17.3 Before applying the **TTC** assessment procedure, each **TSO** has to declare which are the security rules (security criteria and security thresholds) adopted, the worst **Outage** case it has to take into account in order to safeguard its own system security, and the technical constraints limiting the power shift to assess the **NTC** value for a given direction of power flow.

SDC 2.2.17.4 Each **TSO** is responsible for deciding on its own **Grid** topology and the way it intends to perform the generation shift from its side, which must be declared and communicated.

SDC 2.2.18 Already Allocated Capacity and Available Transfer Capacity

SDC 2.2.18.1 During the allocation process (see Chapter SDC 3), that could cover time frames from year ahead to day ahead, a set of new concepts are introduced. These are the **Already Allocated Capacity (AAC)** and **Available Transfer Capacity (ATC)**.

SDC 2.2.18.2 The **AAC** is the total amount of allocated transmission rights while the **ATC** is the part of **NTC** that remain available. **AAC** and **ATC** are thus a result of each stage of the **Allocation Process**.

SDC 2.2.18.3 The following relation exist:

$$\text{ATC} = \text{NTC} - \text{AAC}$$

SDC 2.2.18.4 The following Figure SDC 1 gives an overview over the transfer capacity concept.

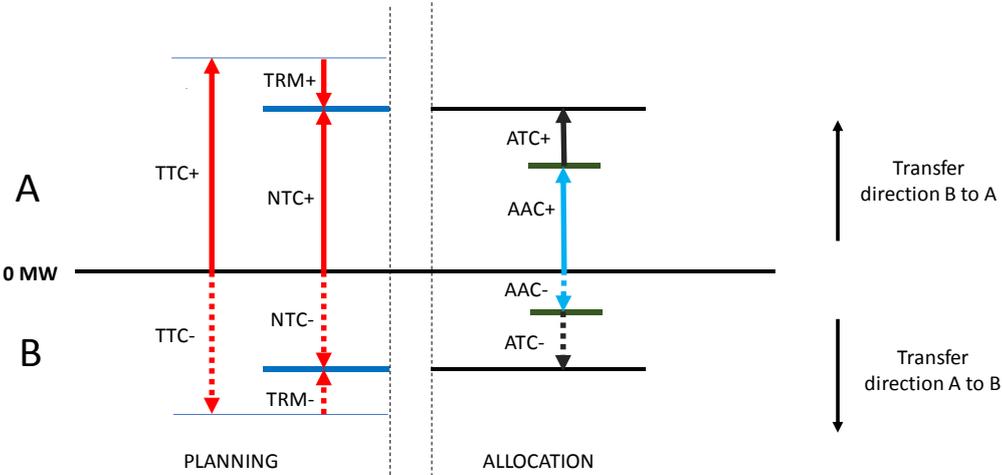


Figure SDC 1. Transfer capacity definitions



SDC 3 ALLOCATIONS PROCESS GUIDELINES

J. Allocation Process contains the terms and conditions for the allocation of **Long-Term Transmission Rights** on **International Interconnections** of **Member States**.

SDC 3.1.1 The **Allocation Process** described in this chapter is related to the **Transfer Capacity** available at the border of each **Member State**, net of the **Reserved Transfer Capacity**.

SDC 3.1.2 The capacity of the interconnection **Merchant Lines** in **Reserved Transfer Capacity** is included.

SDC 3.1.3 Long-term cross-zonal capacity shall be allocated to market participants by the **Regional Market Facilitator** in the form of **Physical Transmission Rights** pursuant to the **Use It or Sell It** principle or in the form of **FTRs (Financial Transmission Rights)**. All **TSOs** issuing **Long-Term Transmission Rights** shall offer long-term cross-zonal capacity through the **Regional Market Facilitator** to **Registered Participants** for at least annual and monthly time frames.

SDC 3.1.4 Regulatory authorities of **Member States** may decide to maintain physical **Long-Term Transmission Rights** on its **Bidding Zone** borders.

SDC 3.1.5 The **Allocation Process** concerning **Reserved Transfer Capacity** in SDC 3.6 is reported.

SDC 3.2 Objective

SDC 3.2.1 These **Allocation Rules** contain the terms and conditions for the allocation of **Transmission Rights** on the **International Interconnections** of **Member States**. The **Registered Participant** will have access to these rules by the signature of the **Participation Agreement**. In particular, the **Allocation Rules** set out the rights and obligations of **Registered Participants** as well as the requirements for participation in **Auctions**. They describe the process of **Auction**, including the determination of **Marginal Price** as a result of **Auction**, the conditions for transfer and return of **Long-Term Transmission Rights**, remuneration of holders of such returned **Long-Term Transmission Rights**, and the processes for curtailment of **Long-Term Transmission Rights** along with invoicing and payment.

SDC 3.2.2 The **Regional Market Facilitator** will publish and keep up-to-date on its website a list of borders where **Long-Term Transmission Rights** are allocated, together with information on the type of **Long-Term Transmission Rights**.

SDC 3.3 Regional Market Facilitator

J. The Regional Market Facilitator shall undertake the allocation functions in accordance with the Allocation Rules and the applicable national legislation. The Regional Market Facilitator shall be the Party signing the Participation Agreement with the Registered Participant.

SDC 3.3.1 The **Regional Market Facilitator** shall undertake the allocation functions in accordance with these **Allocation Rules**.

SDC 3.3.2 For the purposes of these **Allocation Rules**, the **Regional Market Facilitator** shall be the **Party** signing the **Participation Agreement** with the **Registered Participant**.

SDC 3.3.3 The form of the **Participation Agreement** and the requirements for its completion shall be published by the **Regional Market Facilitator** and may be amended from time to time by the **Regional Market Facilitator** without changing any terms and conditions specified in these **Allocation Rules** unless otherwise stated in these **Allocation Rules**.

SDC 3.3.4 The **Regional Market Facilitator** shall publish on its website detailed technical operating provisions of **Allocation Rules**.

SDC 3.4 Requirement for Participation in Auctions and Energy Transfer

J. Technical and financial requirements needed to participate in the Auction.

SDC 3.4.1 Market participants may acquire a **Long-Term Transmission Rights** only from participation in **Auctions** or via transfer.

SDC 3.4.2 The participation both in **Auctions** and in transfers requires that the market participant:

- a) execute a valid and effective **Participation Agreement**;
- b) have access to the **Auction Tool**.
- c) comply with the requirements for provision of collaterals as specified in Article SDC 3.4.4.

SDC 3.4.3 In any case, market participants must fulfil the obligations as specified in the relevant Articles of these **Allocation Rules**.

SDC 3.4.4 *Collaterals*

J. To secure the payment of **Transmission Rights**.

SDC 3.4.4.1 **Registered Participants** shall provide collaterals in order to secure payments to the **Regional Market Facilitator** resulting from **Auctions of Long-Term Transmission Rights**. Only the following forms of collaterals shall be accepted:

- a) a **Bank Guarantee**;
- b) a cash deposit in a dedicated **Business Account**.

SDC 3.4.4.2 Collaterals may be provided in one of the forms mentioned or a combination of these forms, provided that the **Regional Market Facilitator** is entitled as beneficiary to the full collateral.

SDC 3.4.4.3 **Credit Limit** shall always be greater or equal to zero.

SDC 3.4.4.4 The collaterals shall be provided in the currency agreed in **PAEM**.

SDC 3.4.4.5 A **Registered Participant** may request an increase or decrease of the collaterals in form of a **Bank Guarantee** and/or cash deposit or change of the form of the collaterals at any time. A decrease of the collaterals of a **Registered Participant** shall only be allowed if the **Credit Limit** after applying the requested decrease of the collaterals would be greater than or equal to zero.

SDC 3.4.5 *Credit Limit*

J. It is needed to calculate and continuously update the **Credit Limit** of each **Registered Participant** for each subsequent **Auction**.

SDC 3.4.5.1 The **Regional Market Facilitator** shall calculate and continuously update the **Credit Limit** of each **Registered Participant** for each subsequent **Auction**. The **Credit Limit** shall be equal to the amount of the collaterals in place minus any outstanding payment obligations. The **Regional Market Facilitator** shall make this information available to each **Registered Participant** individually through the **Auction Tool**. Maximum payment obligations for a **Registered Participant**, resulting from its **Bid/Bids** registered at the closure of the **Bidding Period**, shall be considered as outstanding payment obligations.

SDC 3.5 Allocation rules

SDC 3.5.1 *General Provisions*

SDC 3.5.1.1 The **Regional Market Facilitator** shall allocate **Long-Term Transmission Rights** to **Registered Participants** by way of **Explicit Allocation**. Prior to the **Auction** the **Regional Market Facilitator** shall publish **Auction Specifications** on its website.

SDC 3.5.1.2 The **Auctions** shall be organized via the **Auction Tool**. Each **Registered Participant** fulfilling the requirements for participating in the **Auction** may place **Bids** in the **Auction Tool** until the relevant deadline for placing **Bids** in the specific **Auction** expires according to the respective **Auction Specification**.

SDC 3.5.1.3 After the relevant deadline for placing **Bids** in the specific **Auction** has expired, the **Regional Market Facilitator** shall evaluate the **Bids** including a comparison against the respective **Credit Limits** of the **Registered Participants**. The results of the **Auction** will be notified to **Registered Participants** via the **Auction Tool**.

SDC 3.5.1.4 The **Regional Market Facilitator** shall provide information on forthcoming **Auctions** by publishing on its website a provisional **Auction** calendar with the dates of **Auctions** reasonably in advance before the **Auctions** take place.

SDC 3.5.2 *Capacity Allocation Timeframe and Form of Product*

J. Definition of typologies and timeframe of available financial and physical products

SDC 3.5.2.1 The standard **Forward Capacity Allocation** timeframes, subject to product availability, are defined as follows:

- a) yearly timeframe, starting on the first day and ending on the last day of a calendar year;
- b) monthly timeframe, starting on the first day and ending on the last day of a calendar month.
- c) daily timeframe, starting on the day preceding the delivery day (Sunday - Saturday).

SDC 3.5.2.2 For the standard timeframes and subject to **NTC** availability, the **Regional Market Facilitator** shall organize by default at least one **Auction** per year for the yearly timeframe, one **Auction** per month for the monthly timeframe and one **Auction** per day for the daily timeframe.

SDC 3.5.3 *Auction Specification*

J. Define the characteristic of the **Auction**

SDC 3.5.3.1 The **Regional Market Facilitator** shall publish the provisional **Auction Specifications** that shall state in particular:

- a) the code identifying the **Auction** in the **Auction Tool**;
- b) type of **Long-Term Transmission Rights**;
- c) **Capacity Allocation** timeframe (yearly, monthly, daily);
- d) form of product (base, peak, off-peak);
- e) identification of cross-border(s) bidding;
- f) deadline for return of the **Long-Term Transmission Rights** allocated in previous **Auctions** for the respective cross-border(s) bidding.
- g) the **Product Period**;
- h) **Reduction Period(s)** associated with the **Product Period** when applicable;
- i) the **Bidding Period**;
- j) the deadline for the publication of the provisional **Auction** results;
- k) the contestation period;
- l) the provisional offered capacity which shall not include cross-zonal **TTC** released via return of **Long-Term Transmission Rights**.
- m) any other relevant information or terms applicable to the product or the **Auction**.

SDC 3.5.3.2 After publication of the provisional **Auction Specification**, the **Regional Market Facilitator** shall publish the final **Auction Specification**.

SDC 3.5.3.3 The final offered capacity shall consist of:

- a) the provisional offered capacity;
- b) the available cross-zonal **TTC** already allocated to **Registered Participants** for which a valid request for return of **Long-Term Transmission Rights** has been submitted for this **Auction**.

SDC 3.5.3.4 The **Regional Market Facilitator** shall also publish the format of the **Bids** to be used.

SDC 3.5.4 *Reduction Periods of Offered Capacity*

J. If applicable, announcement of forecast **Reduction Period (curtailment)**

SDC 3.5.4.1 The **Regional Market Facilitator** may announce one or more **Reduction Periods** in the **Auction Specification**. In this case, the **Auction Specification** shall include, for each **Reduction Period**, information on the duration of the **Reduction Period** and the amount of offered capacities.

SDC 3.5.4.2 **Reduction Periods** do not apply to already allocated **Long-Term Transmission Rights** and shall not be considered for any purpose including compensation as a curtailment according to Section SDC 3.9.

SDC 3.5.5 *Bids Submission*

J. Describe the requirement of **Bids submission.**

SDC 3.5.5.1 A **Registered Participant** shall submit a **Bid** or set of **Bids** to the **Regional Market Facilitator** in accordance with following requirements:

- a) it shall be submitted electronically using the **Auction Tool** and during the **Bidding Period** as specified in the **Auction Specification**;
- b) it shall identify the **Auction** via an identification code as specified in Article SDC 4.2.2;
- c) it shall identify the **Registered Participant** submitting the **Bid**;
- d) it shall identify the **Bidding Zones** border and the direction for which the **Bid** is submitted;
- e) it shall state the **Bid Price**, in currency agreed in **PAEM** per MW for one hour of the **Product Period** and equal to or greater than zero;
- f) it shall state the **Bid Quantity** in full MW which shall be expressed without decimals; the minimum amount of a single **Bid** is one (1) MW.
- g) a **Registered Participant** may modify its previously registered **Bid** at any time during the **Bidding Period** including cancellation. In case the **Bid** has been modified, only the last valid modification of the **Bid** shall be considered for the **Auction** results determination.
- h) if a **Bid Quantity**, or a quantity calculated as a sum of the **Bid Quantity** for several **Bids** submitted for the same **Auction**, by a **Registered Participant** exceeds the offered capacity announced in the final **Auction Specification**, this **Bid**, or these **Bids** shall be completely rejected. Where

a modification of previously submitted **Bids** results in exceeding the offered capacity, the modification shall be rejected, and the previously registered **Bids** will stand.

SDC 3.5.5.2 The above-mentioned process shall apply to all forms of an **Auction** product and all **Forward Capacity Allocation** timeframes.

SDC 3.5.6 *Bid Registration*

J. Verify the acceptance of **Bids** submission

SDC 3.5.6.1 Provided that a **Bid** or a set of **Bids** fulfils the requirements set forth in SDC 3.5.5, the **Regional Market Facilitator** shall confirm to the **Registered Participant** that such **Bid(s)** have been correctly registered by an acknowledgment of receipt via the **Auction Tool**. If the **Regional Market Facilitator** does not issue an acknowledgment of receipt for a **Bid**, such **Bid** shall be deemed not to have been registered.

SDC 3.5.6.2 The **Regional Market Facilitator** shall notify a **Registered Participant** whose **Bid** is rejected as invalid and the reason for this rejection, without undue delay after the **Bid** is rejected.

SDC 3.5.6.3 The **Regional Market Facilitator** shall maintain a record of all valid **Bids** received.

SDC 3.5.6.4 Each valid **Bid** registered at closure of the **Bidding Period** shall constitute an unconditional and irrevocable offer by the **Registered Participant** to buy **Long-Term Transmission Rights** up to the **Bid Quantity** and at prices up to the **Bid Price** and under the terms and conditions of these **Allocation Rules** and the relevant **Auction Specification**.

SDC 3.5.7 *Credit Limit Verification*

J. At closure of the **Bidding Period** a check whether the maximum payment obligations connected with registered **Bids** exceed the **Credit Limit** shall be made.

SDC 3.5.7.1 At closure of the **Bidding Period**, the **Regional Market Facilitator** shall check whether the maximum payment obligations connected with registered **Bids** exceed the **Credit Limit**. If the maximum payment obligations connected with these **Bids** exceed the **Credit Limit**, these **Bids**, starting with the **Bid** with the lowest **Bid Price**, shall be excluded, until the maximum payment obligations are less than or equal to the **Credit Limit**.

SDC 3.5.7.2 The **Regional Market Facilitator** shall indicate insufficient collaterals as the reason for the **Bid** exclusion in the **Auction** results notification to the **Registered Participant**.

SDC 3.5.8 *Auction Results Determination*

J. Auction results and **Marginal Price** using an optimization function are determined.

SDC 3.5.8.1 After the expiration of the **Bidding Period** for an **Auction** and the **Credit Limit** verification pursuant to Article SDC 3.5.7, the **Regional Market Facilitator** shall determine the **Auction** results and allocate the **Long-Term Transmission Rights** in accordance with this Article SDC 3.5.8.

SDC 3.5.8.2 The **Regional Market Facilitator** shall determine the **Auction** results using an optimization function.

SDC 3.5.8.3 The optimization function should use the clearing price methodology or other methodology defined by **Pan-Arab ARC**. The **Regional Market Facilitator** shall publish explanatory information about the algorithm of optimization function and determination of **Marginal Price**.

SDC 3.5.8.4 The **Auction** results determination shall include the following:

- a) determination of the total quantity of the allocated **Long-Term Transmission Rights** per bidding cross-border and direction;
- b) identification of winning **Bids** to be fully or partially satisfied;
- c) determination of the **Marginal Price** per bidding cross-border and direction. If the total quantity of cross-border **TTC** for which valid **Bids** have been submitted is lower than or equal to the relevant offered capacity for the relevant **Auction**, then the **Marginal Price** shall be zero.

SDC 3.5.8.5 Where a **Reduction Period** is indicated in the **Auction Specification** for an **Auction**, the **Regional Market Facilitator** shall determine the **Auction Results** modified as follows: For each **Reduction Period** the quantity of **Long-Term Transmission Rights** to be allocated to individual **Registered Participants** shall be calculated on a pro-rata basis taking into account the quantity of **Long-Term Transmission Rights** corresponding to the respective winning **Bids** of each **Registered Participant** and the respective reduced offered capacities.

SDC 3.5.9 *Notification of Auction Results*

J. Requirements for publication of **Auction** results.

SDC 3.5.9.1 The **Regional Market Facilitator** shall publish on its website the **Auction** results.

SDC 3.5.9.2 The publication of the **Auction** results for each bidding cross-border included in the **Auction** shall at least comprise the following data:

- a) The total requested Long-Term Transmission Rights in MW.
- b) The total allocated **Long-Term Transmission Rights** in MW.
- c) The **Marginal Price** in currency agreed in **PAEM** per MW per hour.
- d) The number of **Registered Participants** participating in the **Auction**.
- e) The list of names and number of **Registered Participants** who placed at least one winning **Bid** in the **Auction**.
- f) The list of registered **Bids** without identification of the **Registered Participants (Bid curve)**.
- g) The congestion income per **Bidding Zone**. The congestion income is the amount of currency generated by the total allocated for **Marginal Price**.

SDC 3.5.9.3 The **Regional Market Facilitator** shall communicate via the **Auction Tool** to each **Registered Participant** who submitted a **Bid** to a specific **Auction** for each **Bidding Zone** border included in the **Auction** at least the following data:

- a) the allocated Long-Term Transmission Rights for each hour of the Product Period in MW;
- b) the **Marginal Price** in currency agreed in **PAEM** per MW per hour;
- c) the amount due for allocated **Long-Term Transmission Rights** in currency agreed in **PAEM**.

SDC 3.5.10 Contestation of Auction Results

SDC 3.5.10.1 **Registered Participants** shall check the **Auction** results and, where reasonably appropriate, may contest **Auction** results within the contestation period set out in the relevant **Auction Specifications**.

SDC 3.5.10.2 The **Regional Market Facilitator** shall only consider a contestation where the **Registered Participant** is able to demonstrate an error by the **Regional Market Facilitator** in the **Auction** results.

SDC 3.5.10.3 The contestation shall be communicated to the **Regional Market Facilitator** and shall contain the following:

- a) the date of contestation;
- b) the identification of contested **Auction**;
- c) the identification of the **Registered Participant**;
- d) the detailed description of the facts and the reason for contestation;
and
- e) the evidence of erroneous **Auction** results;

SDC 3.5.10.4 The **Regional Market Facilitator** shall notify its decision on the contestation to the **Registered Participant** in time as reported in the relevant **Auction Specifications**.

SDC 3.6 Reserved Transfer Capacity Management

SDC 3.6.1 The **Regional Market Facilitator** shall allocate **Long-Term Transmission Rights** to **Registered Participants** who have **Reserved Transfer Capacity** according to their interconnection capacity property.

SDC 3.6.2 The **Regional Market Facilitator** shall confirm to the **Registered Participants** and maintain a record of this allocations.

SDC 3.7 Usage of Transmission Rights

SDC 3.7.1 *Return of Long-Term Transmission Rights Bought by Auction*

J. Requirements for returning **Long-Term Transmission Rights**.

SDC 3.7.1.1 **Long-Term Transmission Right** holder(s) may return some or all their **Long-Term Transmission Rights** to the **Regional Market Facilitator** for reallocation at any subsequent long-term **Auction** once the final **Auction** results are published.

SDC 3.7.1.2 **Transmission Right** concerning **Reserved Transfer Capacity** shall not be re-sold.

SDC 3.7.1.3 Returned **Long-Term Transmission Rights** shall be a constant band of whole MW(s) over the specific timeframe of the subsequent **Auction**. The **Auction** at which the **Long-Term Transmission Rights** were allocated and the

subsequent **Auction** to which the **Long-Term Transmission Rights** are to be returned shall be for the same form of products.

SDC 3.7.1.4 The minimum volume for a returned **Long-Term Transmission Right** shall be one (1) MW over the specific timeframe of the subsequent **Auction**.

SDC 3.7.1.5 The **Regional Market Facilitator** shall make the volumes of returned **Long-Term Transmission Rights** available at the subsequent long-term **Auction**, increasing the offered capacity announced in the provisional **Auction Specifications** accordingly and equally for each hour of the **Product Period**. The same applies when the offered capacity announced in the provisional **Auction Specifications** for the subsequent long-term **Auction** contains a **Reduction Period**.

SDC 3.7.1.6 **Long-Term Transmission Right** holder(s) wishing to return their **Long-Term Transmission Rights** shall send a notification via the **Auction Tool** to the **Regional Market Facilitator** no later than the deadline specified in the **Auction Specification** for the subsequent **Auction** to which the **Long-Term Transmission Right** is to be returned.

SDC 3.7.1.7 A valid notification of the return shall contain, at least, the following information:

- a) code of the Long-Term Transmission Right holder;
- b) identity of the subsequent **Auction** to which the **Long-Term Transmission Right** is returned;
- c) the volume of the **Long-Term Transmission Rights** for return.

SDC 3.7.1.8 In order to be able to return **Long-Term Transmission Rights** the **Registered Participant** shall:

- a) have a valid and effective Participation Agreement with the Regional Market Facilitator;
- b) hold the relevant **Long-Term Transmission Rights** at the time of the notification of the return;
- c) send the notification before the deadline specified in the **Auction Specifications**;
- d) fulfill its financial obligations concerning relevant **Long-Term Transmission Rights** pursuant to these **Allocation Rules**.

SDC 3.7.1.9 If the return is accepted, the **Regional Market Facilitator** shall decrease the total volume of the **Long-Term Transmission Rights** held by the respective **Long-Term Transmission Right** holder by the amount returned.

SDC 3.7.1.10 **Registered Participants** who returned **Long-Term Transmission Right** are entitled to receive a remuneration equal to the value of the returned **Long-Term Transmission Rights** set during the relevant subsequent **Auction(s)** calculated for each hour as follows:

- a) the **Marginal Price** of the **Auction** at which the returned **Long-Term Transmission Right** was reallocated in currency agreed in **PAEM** per MW per hour multiplied by
- b) the quantity of MW which was reallocated.

SDC 3.7.2 Transfer of Long-Term Transmission Rights

J. Requirements for transfer of Long-Term Transmission Rights.

SDC 3.7.2.1 **Long-Term Transmission Right** holder(s) may transfer some or all their **Long-Term Transmission Rights** to another **Registered Participant** once the **Auction** results in respect of those rights are defined.

SDC 3.7.2.2 **Transmission Right** concerning **Reserved Transfer Capacity** could be also transferred.

SDC 3.7.2.3 The minimum volume of **Long-Term Transmission Rights** that may be transferred shall be one (1) MW over one (1) hour.

SDC 3.7.2.4 The **Transferor** shall send a notification of the transfer to the **Regional Market Facilitator** via the **Auction Tool** with the following information:

- a) the codes of the **Transferor** and **Transferee**;
- b) the time period of the transfer including the start and end dates and hours;
- c) the volume (MW) of the transferred **Long-Term Transmission Right** in whole MW(s) defined per hour.

SDC 3.7.2.5 The notification of the transfer shall be delivered to the **Regional Market Facilitator** no later than the time indicated in the relevant **Auction Specifications**.

SDC 3.7.2.6 In order to be able to transfer the **Long-Term Transmission Rights** the following requirements shall be fulfilled:

- a) The **Transferor** and **Transferee** should have a valid and effective **Participation Agreement** with the **Regional Market Facilitator**.
- b) The **Transferor** holds the concerned **Long-Term Transmission Rights** at the time of the notification of the transfer.
- c) The **Transferor** has fulfilled its financial obligations concerning relevant **Long-Term Transmission Rights** pursuant to this **Allocation Rules** regardless whether the **Transferor** transfers all or only part of its **Long-Term Transmission Rights** and even in the case of multiple transfers among several **Registered Participants**.
- d) The **Transferor** has delivered the notification of the transfer before the defined deadline reported in the relevant **Auction Specifications**.

SDC 3.7.2.7 The **Regional Market Facilitator** shall issue an acknowledgement of receipt of the notification to the **Transferor** and shall inform the **Transferee** about the notification of the transfer.

SDC 3.7.2.8 The notification of transfer shall be confirmed by the **Transferee** no later than the time indicated in the relevant **Auction Specification**.

SDC 3.7.2.9 The **Transferor** shall not be entitled to withdraw the transfer notification once the **Transferee** has accepted it.

SDC 3.7.3 Use and Remuneration of Long-Term Transmission Rights

J. Definition of remuneration of Long-Term Transmission Right.

SDC 3.7.3.1 **Long-term Transmission Rights** shall be subject to the **Use it or Sell It** principle.

SDC 3.7.3.2 Where **TSOs** issue and apply **Long-Term Transmission Rights** on **Bidding Zone** borders, they shall enable **Long-Term Transmission Rights** holders and/or their counterparties to nominate their **Energy Transfers** schedules.

SDC 3.7.3.3 The holder of allocated **Long-Term Transmission Rights**, and their counterparties where applicable, shall nominate all or part of their **Long-Term Transmission Rights** for its physical use in accordance with **Nomination Rules**.

SDC 3.7.3.4 The **Regional Market Facilitator** shall publish a list with the relevant **Nomination Rules** for the **Bidding Zone** borders on its website. **Nomination Rules** shall contain at least the following information:

- a) the entitlement of a physical transmission rights holder to nominate **Energy Transfer** schedules;
- b) minimum technical requirements to nominate;
- c) description of the nomination process;
- d) nomination timings;
- e) format of nomination and communication.

SDC 3.7.3.5 The Nomination shall be done in compliance with the **Rights Document** (see Article SDC 3.7.4).

SDC 3.7.3.6 In case the **Registered Participant** does not nominate its **Long-Term Transmission Rights**, the **Regional Market Facilitator** shall make the underlying cross-zonal NTC of the non-nominated **Long-Term Transmission Rights** available for the relevant daily allocation. The **Physical Transmission Right** holders who do not nominate their **Long-Term Transmission Rights** for physical use of their rights shall be entitled to receive remuneration as described below.

SDC 3.7.3.7 The remuneration shall be calculated as the difference between the volumes stated in the **Rights Document** and the final volumes nominated and accepted by the relevant **TSO**, multiplied by the **Marginal Price** of the daily **Auction** at which that **Long-Term Transmission Right** was reallocated, for the concerned hourly period.

SDC 3.7.4 *Rights Document*

SDC 3.7.4.1 The **Rights Document** shall contain the information about the volume in MW that eligible persons are entitled to nominate at specific **Bidding Zone** borders and directions and for hourly periods in case of **Long-Term Transmission Rights** identified by **Capacity Agreement Identification (CAI)**.

SDC 3.7.4.2 Eligible entities may be the following:

- a) the **Long-Term Transmission Rights'** holder; or
- b) entities notified by the **Transmission Rights'** holder during the Nomination process to the respective **TSOs** in line with the relevant **Nomination Rules**;

SDC 3.7.4.3 The **Regional Market Facilitator** shall send the **Rights Document** daily, via the **Auction Tool** to the eligible entity, according the time indicated in the relevant **Nomination Rules**.

SDC 3.7.5 *Use of Daily Transmission Rights*

J. Physical allocation of daily **Transmission Right**.

SDC 3.7.5.1 Daily **Transmission Rights** allocated in an **Auction**, shall be subject to the Use it or Lose It principle with no financial compensation.

SDC 3.7.5.2 The holder of allocated **Transmission Rights** may nominate the **Transmission Rights** for its physical use.

SDC 3.7.5.3 Persons eligible to nominate **Transmission Rights** shall fulfill the requirement described in **Nomination Rules**.

Eligible entities may be the following:

- a) the **Transmission Rights'** holder; or
- b) the entity notified by the **Transmission Rights'** holder during the Nomination process to the respective **TSOs** in line with the relevant **Nomination Rules**;

SDC 3.7.5.4 The Nomination shall be done in compliance with the **Rights Document**.

SDC 3.7.5.5 The **Regional Market Facilitator** shall publish a list with the relevant **Nomination Rules** for the **Bidding Zone** borders on its website.

SDC 3.7.5.6 The nomination deadlines for respective **Bidding Zone** borders are set forth in the relevant **Nomination Rules**. The **Regional Market Facilitator** shall publish information on its website on the nomination deadlines per **Bidding Zone** border.

SDC 3.7.5.7 The **Regional Market Facilitator** shall send the **Rights Document** daily according to the time indicated in the relevant **Nomination Rules**. The **Rights Documents** shall be considered provisional until the end of the contestation period.

SDC 3.8 **Fallback Procedures**

J. Requirement for fallback procedure of standard process.

SDC 3.8.1.1 The **Regional Market Facilitator** shall define a fallback procedure in all cases of failure of a standard process within its own responsibility.

SDC 3.9 Curtailment

J. Transmission Rights irrespective of the **Product Period** may be curtailed in the case of **Force Majeure Event**, or to ensure operation remains within operational security limits.

SDC 3.9.1.1 Curtailment may be applied on allocated **Long-Term Transmission Rights** including, where the case may be, on nominated **Long-Term Transmission Rights**.

SDC 3.9.1.2 Each **Registered Participant** affected by curtailment shall lose its right to transfer, return or nominate for physical use the concerned **Long-Term Transmission Rights** or to receive remuneration based on the Use-It-or-Sell-It principle.

SDC 3.9.1.3 In case of curtailment, the affected **Registered Participant** is entitled to receive reimbursement or compensation according to Article SDC 3.9.3.

SDC 3.9.2 *Process and Notification of Curtailment*

SDC 3.9.2.1 The curtailment shall be carried out by the **Regional Market Facilitator** based on a request by one or more **TSO(s)** at the **Bidding Zone** border where **Long-Term Transmission Rights** have been allocated.

SDC 3.9.2.2 The **Regional Market Facilitator** shall notify the affected holders of **Long-Term Transmission Rights** as soon as possible of a curtailment of **Long-Term Transmission Rights** including the triggering event via email and on the webpage of the **Regional Market Facilitator**. The notification shall identify the affected **Long-Term Transmission Rights**, the affected volume in MW per hour for each concerned period, the triggering events for curtailment, and the amount of **Long-Term Transmission Rights** that remain after the curtailment.

SDC 3.9.2.3 The curtailment shall be applied to **Long-Term Transmission Rights** of the concerned periods on a pro rata basis, which means in proportion to the held **Long-Term Transmission Rights**, regardless of the time of allocation.

SDC 3.9.3 *Compensation for Curtailments*

J. Calculation of curtailment compensation

SDC 3.9.3.1 In cases of curtailment the compensation for each affected hour and **Registered Participant** shall be calculated as:

- a) the **Marginal Price** of the initial **Auction** multiplied by
- b) the volume in MW per hour corresponding to the difference between the **Long-Term Transmission Rights** held by the **Registered Participant** before and after the curtailment.

SDC 3.10 Invoicing and Payment

SDC 3.10.1.1 A **Registered Participant** shall pay the amounts due as calculated in accordance with Article SDC 3.10.2 for all **Long-Term Transmission Rights** allocated to him. This obligation shall be fulfilled irrespective of any return or transfer or curtailment of all or some of these **Long-Term Transmission Rights** in accordance with these **Allocation Rules**.

SDC 3.10.2 *Calculation of Due Amounts*

J. Obligation and calculation regarding payment of the amount of **Transmission Right**

SDC 3.10.2.1 **Registered Participants** shall pay for each of the **Long-Term Transmission Rights** allocated to them an amount equal to:

- a) the **Marginal Price** (per MW per hour); multiplied by
- b) the sum of **Long-Term Transmission Rights** in MW allocated in individual hours of the **Product Period** incorporating any **Reduction Period** where relevant.

SDC 3.10.2.2 Upon the collection of the payment, the **Regional Market Facilitator** shall update the **Credit Limit** accordingly.

SDC 3.10.3 *Invoicing and Payment Conditions*

J. Definition of time to send invoice and update of **Credit Limit**.

SDC 3.10.3.1 Payments shall be settled before the start of the **Product Period** according to the deadline specified in an **Auction** calendar, published on **Regional Market Facilitator** website.

SDC 3.10.3.2 The **Regional Market Facilitator** shall issue invoices for payments for all **Long-Term Transmission Rights** on a monthly basis in accordance with the **Auction** calendar, published on **Regional Market Facilitator** website.

SDC 3.10.3.3 The invoices shall be issued for the following payments:

- a) the amount of the monthly instalment(s) if the **Long-Term Transmission Right** has a duration of more than a month;
- b) the amount due if the **Long-Term Transmission Right** has a duration equal to a month or less;
- c) any relevant taxes and levies.

SDC 3.10.3.4 The **Regional Market Facilitator** shall send the invoice to the **Registered Participant** or it should make it available to the **Registered Participant** via the **Auction Tool**.

SDC 3.10.3.5 In the cases of curtailment of **Long-Term Transmission Rights**, the invoices shall consider any payments to be credited to the **Registered Participant** regarding return of **Long-Term Transmission Rights** remuneration.

SDC 3.10.3.6 Upon the collection of the payment, the **Regional Market Facilitator** shall update the **Credit Limit** accordingly.

SDC 4 DAILY SCHEDULING

SDC 4.1 Introduction

J. The scheduling processes described in this document not only support but even enhance the commercial cross-border **Actual Energy Transfer** as desired by **Member States**. Within this scope this Chapter describes in a general approach how to run this process within **PAEM**.

SDC 4.1.1.1 This document describes the scheduling process only for normal operational conditions.

SDC 4.1.1.2 The **Regional Market Facilitator** and **TSOs** are responsible for the process coordination.

SDC 4.1.1.3 The type of control hierarchy and organization of the structure regarding the information exchange for the scheduling process are to the responsibility of the **Arab TSOs Committee** and **Pan Arab ARC**.

SDC 4.1.1.4 A description of this process begins with a simplified representation of a **Synchronous Area** is showed in Figure 6-1.

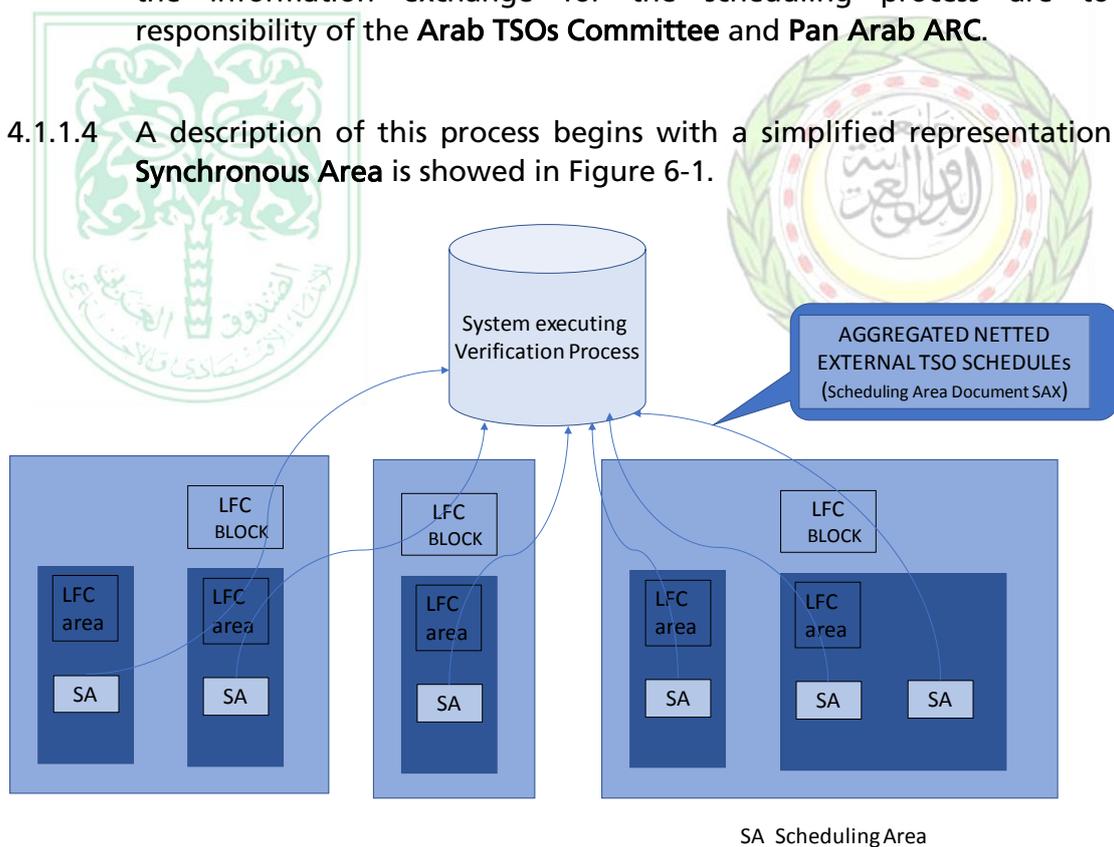


Figure 6-1. Information exchange for the scheduling process in a synchronous zone

- SDC 4.1.1.5 The daily **Verification Process** and accounting and settlement activities concerning **PAEM** cross-border **Energy Transfer** are in charge of the **Market Facilitator** coordinated by **Arab TSOs Committee**.
- SDC 4.1.1.6 **Arab TSOs Committee** could alternatively delegate to carry out these activities a department in one of the **Control Center** of a specific **Control Area**.
- SDC 4.1.1.7 The **Synchronous Area** consists of multiple interconnected **Control Areas/Control Blocks**, each of them with centralized **Secondary Control**. Each **Control Area/Control Blocks** may be divided into sub-**Control Areas** that operate their own underlying **Secondary Control**, assuming this does not jeopardize interconnected operation. The hierarchy of **Secondary Control** consists of the **Synchronous Area**, with **Control Blocks** and (optionally) included **Control Areas** as showed in Figure 6-1.
- SDC 4.1.1.8 If a **Control Block** has internal **Control Areas**, the **Control Block** organizes the internal **Secondary Control** according to one of the following schemes (basically, the type of internal organization shall not influence the behavior or quality of **Secondary Control** between the **Control Blocks**):
- a) Centralized: **Secondary Control** for the **Control Block** is performed centrally by a single controller (as one **Control Area**); the operator of the **Control Block** has the same responsibilities as the operator of a **Control Area**.
 - b) Pluralistic: **Secondary Control** is performed in a decentralized way with more than one **Control Area**; a single **TSO**, called the **Block Coordinator**, regulates the whole block towards its neighbors with its own controller and regulating capacity, while all the other **TSOs** of the block regulate their own **Control Areas** in a decentralized way individually;
 - c) Hierarchical: **Secondary Control** is performed in a decentralized way with more than one **Control Area**; a single **TSO**, the **Block Coordinator**, operates the superposed block controller which directly influences the subordinate controllers of all **Control Areas** of the **Control Block**; the **Block Coordinator** may or may not have regulating capacity on its own.
- SDC 4.1.1.9 In order to fulfil these functions, **Secondary Control** operates by the **Network** characteristic method. **Secondary Control** is applied to selected generator sets in the **Power-Generating Facilities** comprising this control loop. **Secondary Control** shall be dissociated from primary control. This behavior over time should be associated with the PI (proportional-integral) characteristic of the secondary controller.
- SDC 4.1.1.10 Each **Control Area/Control Block** shall be operated by an individual **TSO** that has the responsibility for the **Transmission System** operation of this area

(usually coincident with the territory of a company or a country), including the responsibility for availability, operation and provision of primary control, secondary control and tertiary control within the **Control Area/Control Block** to maintain the **Actual Energy Transfer** of its **Control Area/Control Block** at the **Scheduled Energy Transfer** value and, consequently, to support the restoration of frequency deviation in the interconnected **Network**.

SDC 4.1.1.11 The type of control hierarchy and organization shall not influence the behavior or quality of secondary control in a negative way or introduce control instability (e.g. cascaded controllers with integral parts can result in impaired or unstable secondary control).

SDC 4.1.1.12 A **Control Block** may divide up into sub-**Control Areas** that operate their own underlying generation control.

SDC 4.1.1.13 Each **TSO** operates enough control reserves under automatic control by the **Secondary Control** to meet its obligation to continuously balance its generation and interchange schedules to its load for the **Control Area/Control Block**.

SDC 4.1.1.14 Any change in the **Energy Transfers** that occurs out of the market – i.e. an emergency **Energy Transfer** – is considered a change in the **Scheduled Energy Transfer** and shall be regulated through multilateral procedures.

SDC 4.2 Exchange Scheduling Data

J. Rules to define daily cross-border **Actual Energy Transfer**.

SDC 4.2.1.1 The netted aggregation of the **External TSO Schedules** between two related **Scheduling Areas** shall be bilaterally agreed upon using the **Agreement Process** before the delivery. After that, the **Verification Process** shall be performed.

SDC 4.2.1.2 The sum of the **Netted Area Positions** of all **LFC Areas** for each time unit of a **Synchronous Area** shall be at any time equal to zero. The **Market Facilitator** ensure this by performing the **Verification Process**.

SDC 4.2.1.3 An **HVDC System** crossing the border of a Pan-Arab **Synchronous Area** between two related **Scheduling Areas** or a **HVDC System** within a Pan-Arab **Synchronous Area** between two related **Scheduling Areas** is considered in the Pan-Arab scheduling process like an **AC International Interconnection**, even if it is treated in the **Scheduling Area** as a **Power-Generating Facility** or a **Load Facility**. The netted aggregation of the **External TSO Schedules**

concerning **HVDC Systems** shall be reported separately from the netted aggregation of the **TSO External Schedules** concerning **AC** links.

SDC 4.2.1.4 The following general rules for scheduling between **TSOs** and **LFC Area, LFC Block** or **Market Facilitator** apply:

- a) Standards for identification.
- b) Resolution for time interval, content and precision of the exchanged **SAX (Scheduling Area Exchange Document)**.
- c) **Verification Process**.
- d) Troubleshooting in case of problems with data exchange.
- e) Agreed timing for processes.

SDC 4.2.2 *Framework for Pan Arab Coding Scheme*

SDC 4.2.2.1 For the electronic exchange of documents referring to the scheduling process among **Member States**, a common identification of the involved Pan Arab entities (**Scheduling Areas, LFC Areas, LFC Blocks** and **Market Facilitator**) on all levels (**Energy Identification Code**) shall be defined. This implies that each entity within the **PAEM** organization shall be identified as a **Party** (EIC-X-code). Depending on the role being played, different role type codes shall be applied to **TSO, LFC Area, LFC Block** and **Market Facilitator**. Areas shall be identified by EIC-Y-code. The registration or change of an **Energy Identification Code** shall be coordinated by **Arab TSOs Committee**. For this, every **Party** is responsible for informing all other involved **Parties**. The valid list of codes shall be published at the **Market Facilitator** website.

SDC 4.2.3 *Electronic Data Exchange*

SDC 4.2.3.1 Electronic **Data Exchange** is used for scheduling between **Scheduling Areas, LFC Areas, LFC Blocks** and **Coordination Center Zones**. The communication facilities shall fulfill the specified availability and performance to facilitate this process. It is the responsibility of all **TSOs** to operate their IT processes, including the communication, with acceptable performance.

SDC 4.2.3.2 The electronic **Data Exchange** format for **Verification Process** shall be agreed upon by the involved **TSOs**.

SDC 4.2.4 *Time Interval*

- SDC 4.2.4.1 The following resolutions for the time intervals shall be allowed: $t_i = 1\text{min}$, $\frac{1}{4}\text{h}$, $\frac{1}{2}\text{h}$ or 1h .
- SDC 4.2.4.2 The scheduling process shall be available every day from 00:00 to 24:00 (GMT+2).

SDC 4.2.5 *Troubleshooting*

- SDC 4.2.5.1 The **Parties** involved in the scheduling process having trouble with the transmission of data to their related counterparties should either accept the counter **Scheduled Energy Transfer** values or agree upon the values on the phone with their counterparties.

SDC 4.2.6 *Verification Process*

- SDC 4.2.6.1 **Market Facilitator** is responsible for performing the **Verification Process**.
- SDC 4.2.6.2 After completing each Agreement, the **TSO** shall assemble and transmit a **SAX** to the entity performing the **Verification Process**. This transmission shall also take place in the case of any modifications.
- SDC 4.2.6.3 The **TSO** is responsible for the transmission of **SAXs** to the entity executing the **Verification Process**.
- SDC 4.2.6.4 The entity performing the **Verification Process** shall verify the **SAXs**. As part of the **Verification Process** a status report will be sent to respective **TSOs**.
- SDC 4.2.6.5 The **Verification Process** compares corresponding values of the netted aggregation of the **External TSO Schedules** dedicated to the same border without applying corrective measures.
- SDC 4.2.6.6 A positive verification result shall have the same values for a given direction and for all time intervals in each time frame.
- SDC 4.2.6.7 In case of a negative verification result the related **TSOs** have the obligation to resolve it.

SDC 4.2.6.8 The aggregation of all the netted aggregation of the **External TSO Scheduled** exchanges shall sum up to zero within the same **Synchronous Area**.



SDC 5 ON-LINE INTERCONNECTION SYSTEM MONITORING

J. The task of online observation is performed during the real-time phase to control the state of the **PAEM Electricity System**.

SDC 5.1.1 The task of online observation is performed during the real-time phase. In order to prevent systemic faults in the context of **LFC**, it is essential to check the **PAEM**-wide consistency of the input variables for online operation used by the single **Parties** involved. This comprises the control deviation used as an input value for **Load Frequency Control** as well as the real-time observation of cross-border **Actual Energy Transfer** among all **Control Areas/Control Blocks** of **PAEM**.

SDC 5.1.2 In this regard, **Regional Market Facilitator**, **LFC Block Operators** and **LFC Area Operators** all have responsibility.

SDC 5.2 Actual Energy Transfer

SDC 5.2.1 The **Actual Energy Transfer** constitutes the power interchange setpoint for the **Control Areas' Secondary Control**. In order to prevent excessive fluctuations on interconnections when program changes occur, it is necessary that this jump is converted to a ramp lasting 10 minutes in total, starting 5 minutes before the agreed change of the **Actual Energy Transfer** and ending 5 minutes later, regardless of the time-step (one hour, 30 minutes or 15 minutes).

SDC 5.2.2 In order to prevent unintentional frequency deviations and major control actions under undisturbed conditions, **TSOs** are required to maintain careful compliance with times for program changes, particularly where changes in the **Actual Energy Transfer** of several hundred MW are involved. Care must be taken to ensure that generating capacity is brought on line or disconnected on a staggered basis.

SDC 5.2.3 A substantial change in **Actual Energy Transfer** shall not have a negative impact upon system operation of the type which might be associated with a disturbance.

SDC 5.3 Tie-Line Metering, Monitoring and Control

SDC 5.3.1 The **LFC Block Operators** shall acquire the metering data of the tie-lines to adjacent **LFC Block** to record the energy in the time-frame used for power exchanges.

SDC 5.3.2 The **Market Facilitator** shall be provided with data of total hourly **Scheduled Energy Transfers** for each **LFC Block** and real-time active power tele-measurements of each tie-line crossing the borders of **PAEM** system.

SDC 5.3.3 General controls on interconnection system between **Control Area, Control Block Operators** are described below.

SDC 5.3.4 *Actual Energy Transfer and Unintentional Deviations*

SDC 5.3.4.1 The following rules apply:

- a) The sum of **Actual Energy Transfer** of each **Control Area, Control Block** of a **Synchronous Area** shall be equal to zero at any time.
- b) The sum of **Unintentional Deviation** of all **Control Area** of a **Control Block** shall be equal to the **Unintentional Deviation** of the **Control Block** concerned.
- c) The sum of **Unintentional Deviation** of all **Control Blocks** of a **Synchronous Area** shall be equal to zero at any time.

SDC 5.3.5 *Physical Energy Transfers*

SDC 5.3.5.1 The following rules apply:

- a) The sum of the physical **Energy Transfers** of all **Control Areas** of a **Control Block** shall be equal to the physical **Energy Transfer** of the **Control Block** concerned.
- b) The sum of the measurements of the physical **Energy Transfer** of all **Control Blocks** of a synchronous area is equal to zero at any time.

SDC 5.3.6 *Perturbation of Measurement Equipment*

SDC 5.3.6.1 The following rules apply:

- a) The operator of the relevant **Control Area** shall inform the neighboring **LFC Area Operators** and the corresponding operator of the **Control Block** of any perturbation in the measurement equipment regarding the physical **Energy Transfer** crossing the border with the neighboring **Control Area**.
- b) The operator of the relevant **Control Block** shall inform the neighboring **LFC Block Operator** about any perturbation in the measurement equipment regarding the physical **Energy Transfer** crossing the border with the neighboring **Control Block**.

SDC 5.3.7 *Measures in Case of Discrepancies*

SDC 5.3.7.1 The following rules apply:

- a) Observation of **Unintentional Deviations** are used to identify and correct as soon as possible abnormal operating and accounting situations (e.g. abnormal values of tie-line tele-measurements, misunderstanding in setting the **Actual Energy Transfer** of a **Control Area**).
- b) The **LFC Block Operator** shall contact the responsible **Control Area Operator** as soon as possible in order to take corrective measures and resume normal operation.

SDC 5.3.8 *Transmitted and Calculated Unintentional Deviation Differs*

SDC 5.3.8.1 If the transmitted **Unintentional Deviation** of a **Control Area** differs from the **Unintentional Deviation** calculated by the **Control Block**, the operator of the relevant **Control Block** shall immediately contact the operators of the corresponding **Control Areas** to resolve the issue.

SDC 5.3.9 *Unintentional Deviations Sum*

SDC 5.3.9.1 In case that the sum of the **Unintentional Deviations** of the **Control Areas** in a **Control Block** is not equal to the **Unintentional Deviation** of the **Control Block**, the operator of the relevant **Control Block** shall contact the corresponding operators of the **Control Areas** in order to solve the problem.

SDC 5.3.10 *Actual Energy Transfer Sum*

SDC 5.3.10.1 In case that the sum of the **Actual Energy Transfer** of the **Control Areas** in a **Control Block** is not equal to **Actual Energy Transfer** of the **Control Block**, the operator of the relevant **Control Block** shall inform the corresponding operators of the **Control Areas**.

SDC 6 ACCOUNTING AND SETTLEMENT OF UNINTENTIONAL DEVIATIONS

J. The task of accounting of **Unintentional Deviations** is performed "after the fact", to validate meter measurement data, before the settlement of each **Control Area**.

SDC 6.1.1 The task of accounting of **Unintentional Deviations** is performed "after the fact", at the next working day following the system operation. It comprises the validation of meter measurement data, followed by the derivation and matching of accounting data, before the settlement of the account of **Unintentional Deviations** of each **Control Area/Control Blocks** with reference to a recording period is carried out.

SDC 6.1.2 The compensation of **Unintentional Deviations** is performed by using a program of compensation "in kind" within the compensation period, as an import/export of the corresponding amount of energy per tariff period, that was accumulated in the recording period.

SDC 6.1.3 The tariff period shall be defined by **Arab TSOs Committee** according to **Pan Arab ARC** considering season, workday/holiday, peak/low hour and shall be published on **PAEM** website.

SDC 6.1.4 The sum of Compensation Programs of all **Control Blocks**, and respectively of all **Control Areas**, within **PAEM** shall be zero.

SDC 6.2 Workflow for the Accounting and Settlement Process

SDC 6.2.1 The accounting data goes from the bottom to the top (**TSO>Control Area>Control Block>Market Facilitator**).

SDC 6.2.2 The **Unintentional Deviation** as well as the related **Compensation Programs** are calculated and sent from top to bottom (**Market Facilitator > Control Block > Control Area**).

SDC 6.2.3 **Market Facilitator, Control Block** and **Control Area** are responsible for allocating **Unintentional Deviations** which result in **Compensation Programs** for **Control Block** and **Control Area**. Each level shall ensure that there is no difference (or rounding difference) induced by the allocation.

SDC 6.2.4 A small amount of energy which cannot be compensated, due to rounding, remains on the account of **Unintentional Deviations**.

SDC 6.3 Recording Period, Compensation Period

SDC 6.3.1 All TSOs agree on a standard recording period “w” and a standard compensation period. The standard recording period shall be defined to comprise 7 days (one week), (from Sunday, 0:00 to Saturday 24:00) whereas the standard compensation period shall be defined to comprise 7 days (one week), from Thursday, 00:00 to Wednesday 24:00 of the week following the recording period.

SDC 6.3.2 The accounting process is based on the recording period “w”. The compensation of **Unintentional Deviations** is performed “in kind” within the compensation period – as an import/export of the corresponding amount of energy per tariff period, that was accumulated in the recording period. Figure SDC 2 gives an overview to this procedure.

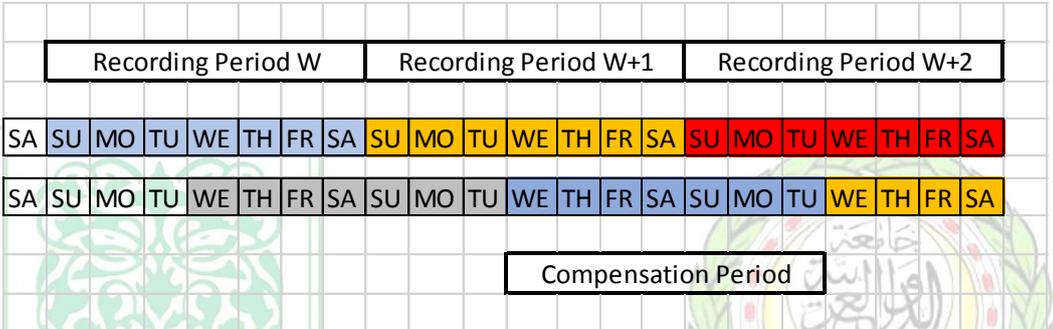


Figure SDC 2. Recording and Compensation Period

SDC 6.4 Accounting and Settlement General Rules

J. Relevant rules to perform accounting and settlement of Unintentional Deviations.

SDC 6.4.1 Accounting and Settlement Period

SDC 6.4.1.1 The daily accounting and settlement are done for the day “D” on the next working day.

SDC 6.4.1.2 The weekly accounting and settlement are done for the recording period.

SDC 6.4.2 Time Frame

SDC 6.4.2.1 The time frame for accounting of **Unintentional Deviations** shall correspond with the time frame of the **Actual Energy Transfer** (1h, ½ h, ¼ h). The time frame shall be the same on a common border between two areas.

SDC 6.4.3 *Rounding Rules*

SDC 6.4.3.1 Generally, the data exchanged is in MWh. If all **Control Areas** in a **Control Block** agree, a mathematical rounding in kWh can be performed. The program for compensation of **Unintentional Deviation** of a **Control Block** shall be in full MW only. By default, the program for the compensation of **Unintentional Deviations** for a **Control Area** should be in MW but if all **Control Areas** in a **Control Block** agree, the program for the compensation of **Unintentional Deviations** may be in kW. The remaining amount of energy in kWh stays on the account of **Unintentional Deviations**.

SDC 6.4.4 *Electronic Data Exchange*

SDC 6.4.4.1 Electronic data exchange for accounting and settlement is required using e-mail via **PACN**. If the e-mail via **PACN** is disturbed, an electronic back-up shall be agreed such as e-mail via internet. If electronic communication is generally disturbed, fax or phone shall be used as back-up.

SDC 6.4.5 *Modification of the Accounting Process and Related Data*

SDC 6.4.5.1 All involved **TSOs** shall provide the complete and correct information about all issues affecting the accounting process such as new or changes of tie lines (including DC-links), changes of resolution and time frames.

SDC 6.4.5.2 In case of changes, the requesting **TSO** shall inform the affected **TSO**, **Control Area**, **Control Block** and **Market Facilitator** at least 30 days in advance.

SDC 6.5 **Bilateral Agreement for the Accounting/Settlement Process**

J. Agreement among **TSOs** to define exchange data about measurement and accounting data.

SDC 6.5.1 In order to perform the accounting and settlement process in a correct manner, the partners of a common border shall establish a bilateral accounting agreement to define the list of tie-lines, meter measurement and accounting data.

SDC 6.5.2 **TSOs** shall agree on the list of tie-lines to be included in the **PAEM** accounting process. This list also has information about meter measurement and accounting data. It shall provide:

- a) Names of both involved **TSOs**

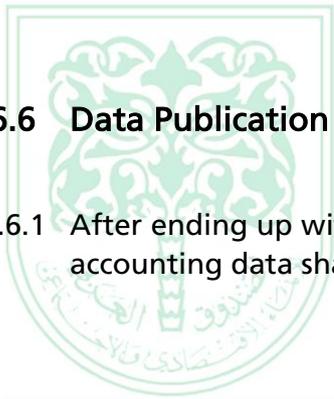
- b) Name of tie-lines
- c) Name and related **TSO** of substations tie line is connecting
- d) List of meter measurement data to be used to derive the accounting value
- e) List of meter measurement data to be exchanged
- f) Identifier (ID) for each meter measurement data to be exchanged
- g) Identifier (ID) of accounting point
- h) If line losses to be considered, agreement on formula to calculate accounting data

SDC 6.5.3 The **TSOs** shall agree on the exchange format for metering, accounting and settlement.

This agreed list shall be transmitted to the **Market Facilitator** for **PAEM** web-site publication. The data from the accounting point shall be used by all **PAEM** bodies involved as a unique representation of the physical **Energy Transfer** concerning the tie-line.

SDC 6.6 Data Publication

SDC 6.6.1 After ending up with the **PAEM** accounting and settlement process the agreed accounting data shall be published on the **PAEM** website.



SDC 7 SYNCHRONOUS TIME CORRECTION

J. Frequency and balancing controls are not perfect. This means that a discrepancy may result between synchronous time and universal coordinated time (UTC).

SDC 7.1.1 Frequency and balancing control are not perfect. There will always be occasional errors in tie-line meters, whether due to transducer inaccuracy, problems with **SCADA** hardware or software, or communications errors. Due to these errors, along with normal load and generation variation, net **Area Control Error (ACE)** in an **International Interconnection** cannot be maintained at zero. This means that frequency cannot always be maintained at exactly its nominal value (50Hz or 60 Hz), and that average frequency over time usually is not exactly 50 Hz or 60 Hz. Each **International Interconnection** shall have a time control process to maintain the long-term average frequency at its nominal value.

SDC 7.1.2 If the mean system frequency in the **Synchronous Area** deviates from the nominal frequency (50 Hz or 60 Hz), this results in a discrepancy between synchronous time and universal coordinated time (UTC)². This time offset serves as a performance indicator for **Primary, Secondary and Tertiary Control** (power equilibrium) and shall not exceed the time defined by **Arab TSOs Committee**.

SDC 7.1.3 The relevant **Coordination Center Zone** is responsible for the calculation of synchronous time and the organization of its correction. Correction involves the setting of the set-point frequency for **Secondary Control** in each **Control Area/Control Block** at 49.95 Hz or 50.05 Hz, depending upon the direction of correction, during the night-time hours³.

SDC 7.1.4 Time error between local mean time and electric clock time on the 60Hz System shall be monitored by the Saudi-Arabian **TSOs** in accordance with its **National Grid Code**.

SDC 7.1.5 When the electric time error has reached a value where correction is required, the relevant **Coordination Center Zone** shall issue instructions to the **Control Area/Control Block** to correct the electric time.

² For example, if frequency has been running 2 mHz high (50.002Hz), a clock using Interconnection frequency as a reference will gain 1.44 seconds in 10 hours intervals $(50.002 \text{ Hz} - 50.000 \text{ Hz}) / 50 \text{ Hz} * 10 \text{ hrs} * 3600 \text{ s/hr} = 1.44 \text{ s}$.

³ Regulating the frequency setpoint to $50 \pm 0,05 \text{ Hz}$, every hour a variation of 6,768 sec will be. So, starting from a time error of 30 sec, in about 5 hours the time error should be next to zero.

SDC 7.1.6 The format of instruction shall be approved by the Arab TSOs Committee.

SDC 7.1.7 If a Control Area/Control Block is disconnected from the Synchronous Area, it should correct its electric clock time to that of the Synchronous Area before reconnecting.

