# SOUTH EAST EUROPE MARKET MONITORING PILOT PLAN

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# FINAL REPORT TO THE 12TH ATHENS FORUM

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## EXECUTIVE SUMMARY

This report provides a summary of findings from the South East Europe (SEE) Market Monitoring Pilot Plan implemented by the National Association of Regulatory Utility Commissioners (NARUC) with support from the United States Agency for International Development (USAID).

The Pilot Plan originated at the Eighth Athens Forum in June 2006. USAID and NARUC assembled a team of consultants to develop the Pilot Plan. The consulting team includes Dr. Peter Kaderjak of the Regional Energy Policy Center (REKK) at Corvinus University in Budapest, Dr. David Newbery of the Energy Policy Research Group (EPRG) at Cambridge University in England, and Dr. Robert Sinclair of Potomac Economics in Fairfax, Virginia. The Pilot Plan was initiated in December 2006 and has continued through the second quarter of 2008. Now that we have gained more than a year of experience with the Pilot Plan, the spring 2008 Athens Forum is an appropriate time to update our findings and to make recommendations.

Our main recommendation is to continue the market monitoring plan under a two-year transition phase that would lead to a sustainable operations phase. We recommend the market monitoring be implemented through the Energy Community Regulatory Board (ECRB) with support of the Energy Community Secretariat (ECS) staff and outside consultants. During the transition phase, outside consultants, supported by USAID, would continue the market monitoring work and assist the ECRB and ECS in establishing a permanent function.

Our recommendation was considered by the Energy Community Regulatory Board (ECRB) and the ECRB Electricity Working Group (ECRB EWG). As stated in the conclusions of the 12th Athens Forum:

> The ECRB supports the enlargement of the market monitoring project to include […] CAO monitoring with [the] suggestion to enlarge the geographical scope of market monitoring to the participants in the future 8th region and CAO participants. The ECRB proposed only publicly available data to be used within the market monitoring according to data available by TSOs and in compliance with Regulation (EC) 1228/2003 and the Congestion Management Guidelines.

The ECRB also indicated that a final recommendation regarding the future of the market monitoring plan will be considered at the September ECRB meeting.

We welcome this action by the ECRB and we look forward to working to offering our support in the implementation of the ECRB policies in this regard.

With respect to Pilot Plan, the following is a full list of our other findings and recommendations:

1. We find that, with the exception of Bulgaria, Transmission System Operators (TSOs) were reasonably cooperative in supplying data and commentary for the project;
2. We find that regional price patterns suggest there is a significant potential for enhancing regional trade and efficiency;
3. We find congestion was persistent in the south western portion of the region;
4. We find indications that on a number of interconnections one of the following situations prevailed (a) Available Transfer Capacity (ATC) was understated; (b) potential unscheduled uses of the system may be occurring; or (c) careful analysis of Net Transfer Capacity (NTC) calculations could lead to increased trade and efficiency;
5. We find that current market outcomes are not consistent with our competitive benchmark model. However, we recognize that the competitive benchmark model assumes a highly-competitive environment, which does not reflect the current level of development in SEE.
6. As indicated above, we recommend continuing the market monitoring during a two-year transition phase leading to sustainable operations phase;
7. We recommend establishing a region-wide system whereby bilateral contract prices are recorded in a standardized manner so that competition policy can be advanced.

In the remainder of this Executive Summary, we discuss each of these major findings and recommendations in more detail along with some secondary findings.

**Data Collection**

The process of procuring data from the Transmission System Operators (TSOs) was generally successful. However, in some instances, data was not provided which prevented us from fully developing our analysis. The following are the most significant data collection issues:

- The most notable issues involved Bulgaria ESO, which did not provide NTC and ATC data during the pilot plan. This data is not only necessary in order for our key analyses, but availability of ATC data is critical for market participants to gain access to the market. This is a serious drawback and represents a fundamental departure on the part of

Bulgaria from principles of transparency that are basic to the success of competitive market restructuring.

- Croatia and Serbia referred us to UCTE[1] for base case exchange data. Serbia also referred us to UCTE for hourly line flow data. Croatia did not respond to requests for loop flow data. Without that data, the interconnection involving Croatia and Serbia could not be fully evaluated with the approach we have chosen.

- TSOs provided generator data only partially. The data that was provided was used in the network model developed by REKK.

- In February 2008, a Market Monitoring Workshop was held in Budapest and representatives of the South East Europe TSOs and regulatory agencies attended. The workshop introduced proposals for new data requirements and analysis and sought input for the participants. Based on the discussions at the workshop and pursuant to our objective to continue development of the monitoring function, a new set of data requests were designed and sent to TSOs in order to initiate the next phase of the monitoring project. This set is likely to be revised, however, in light of the ECRB recommendations at the Athens Forum.

- In 2008, both Macedonia and Montenegro (both which have been highly cooperative in the project) have failed to respond to data requests.

**Regional Prices**

We evaluated the relationship between spot prices in Romania and Austria and found:

- Romania and Austria spot prices diverge significantly, potentially the result of congestion or the inability of market mechanisms to allow traders to arbitrage profitable price differences. Romania prices also may not be reflective of actual region-wide spot market conditions.

**Congestion**

We evaluated the incidence of congestion and found:

- Lack of ATC occurs relatively frequently in the southwest part of the region.

- Formal near-real-time congestion measures are rarely invoked. This was unexpected and suggests that the system may not be fully utilized. We continue to be interested in the reasons why near-real-time congestion would be so uncommon. TSOs have commented

[1] UCTE is the acronym for the Union for Coordinated Transmission of Electricity, a European organization which coordinates the operation of the transmission grid of its 24 country-members.

that the use of informal procedures between the TSOs and generators may be a common practice which renders the formal process unnecessary form an operating perspective.

- Based on a suggestion from a TSO representative, we evaluated variability of NTC and measured a wide variability of NTC from month-to-month. Our analysis shows average month-to-month change in NTC was 46 percent and this is fairly constant over time, indicating the changes were large and not sporadic. We believe further investigation is necessary to determine whether this variation is consistent with a hypothesis that the month-to-month changes arise solely from seasonal planned outages or random outages.

**Cross-Border Capacity Allocation Analysis**

We monitor the market for cross-border capacity by comparing the allocation of interconnection capacity to the actual usage of that capacity. We compare actual physical flows with estimated physical flows associated with cross-border capacity values produced in the Capacity Assessment. Such a comparison provides a market monitoring screen that can detect potential market issues associated with cross-border trading.

We analyzed 20 interconnections and found the following:

- Eight of these 20 interconnections exhibited minimal or no reservations and little or no physical flow occurred in real-time. These relatively inactive interconnections are: Albania to Montenegro; Bulgaria to Romania; Bosnia & Herzegovina to Serbia; Croatia to Serbia; Macedonia to Serbia; Montenegro to Bosnia & Herzegovina; Montenegro to Serbia; and Serbia to Romania. These interconnections tend to be ones that serve power transactions in the west to east direction, which is against the predominant flow in the region. Our screening did not detect potential market or efficiency problems associated with any of these interconnections.

- On five of the 20 interconnections, ATC was non-zero and real-time physical flows were consistent with the reservations on the interconnections. These are Albania to Serbia; Bosnia & Herzegovina to Montenegro; Croatia to Bosnia & Herzegovina; Montenegro to Albania; and Serbia to Montenegro. We do not find that the reservation or usage patterns on these interconnections raise competitive issues.

- On seven of the 20 interconnections, there were results that raise potential competitive issues.

    - On the Serbia-to-Albania interconnection, significant physical capacity was available that was unused while zero ATC was posted, which indicates that ATC may have been underestimated or reserved but not used.

- On the other six interconnections, either the (1) ATC was frequently zero or (2) physical flows were significantly higher than what would be expected given the reserved capacity. These interconnections include Bosnia & Herzegovina to Croatia; Romanian to Bulgaria; Romania to Serbia; Serbia to Bosnia & Herzegovina; Serbia to Croatia; and Serbia to Macedonia. The potential concerns on these interconnections are of two types.
    - First, the excess flow may be the result of unscheduled uses of the system or loop flow volume that is not reflected in the base case assumptions.
    - Second, because in some cases ATC is zero and flow is significant, careful analysis of the Capacity Assessment may be warranted to ensure NTC and ATC values are being maximized in accordance with accepted procedures. While these results may be explained by operating and market conditions, they may also indicate potential efficiency issues or competitive concerns that warrant further investigation.

**Bilateral Contract Data**

We requested data on bilateral contracts and found the following:

- TSOs generally do not maintain the records of bilateral contracts. In instances where they do, prices are not included in the records.
- In light of the general lack of price data on bilateral contracts, we will not move forward at this time on collecting bilateral contract data.
- We recommend a region-wide system whereby bilateral contract prices are recorded in a standardized manner so that competition policy can be advanced through monitoring of actual transactions during periods of congestion.

**TRM**

Transmission Reliability Margin (TRM) represents capacity on interconnections that is reserved to allow for uncertainties in the calculation of import capability. Hypothetically, TRM values that are unnecessarily high can provide the means by which transmission capacity can be removed from the market. In a fully-developed market monitoring plan, TRM calculations would be monitored for accuracy and reasonableness in accordance with accepted procedures. We are currently considering whether and how to monitor these values.

## Monitoring Activities Going Forward

### *Basis for Continuation of Monitoring Pilot Plan*

The Pilot Plan has been in effect for more than one year. At this juncture it must be determined whether and how to continue the monitoring project. The underlying principle which guides our recommendation is the role that market monitoring plays in the effectiveness of restructured competitive markets. It is widely recognized that market monitoring is a critical component of effective competition.[2] Moreover, experience has shown that having a market monitoring function in place prior to the market restructuring is particularly critical (See Frank Wolak, "Lessons from International Experience with market Monitoring", Center for The Study of Energy Markets, WP 134, June 2004). Accordingly, we recommend continuing the market monitoring function beyond the timeframe of the Pilot Plan in order to ensure the monitoring function is in place prior to the full restructuring of the market.[3]

*Market Monitoring Going Forward*

We have analyzed several options regarding the form and function of the market monitoring going forward. Based on the benefits and drawbacks to each of the options, the following are our conclusions and recommendations:

- We find the ECRB's place within the structure of the Treaty provides the most suitable location for market monitoring. The Treaty envisions the ECRB functioning under the direction of the Ministerial Counsel to ensure the objectives of the treaty, including ensuring competitive conduct with respect to cross-border trading. Accordingly, we recommend that market monitoring be conducted under the ECRB.

- We find that the ECRB will require time to develop the necessary capacity to carry out the monitoring function. Therefore, we recommend a two-year transition phase for the market monitoring that would lead to a sustainable operational phase.

- We recommend market monitoring be conducted through a combination of ECS staff (which serves the ECRB staff) and outside consultants under the guidance of ECRB.

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2 See, *e.g*., Newbery, D., and R. Green, "Review of the Monitoring of Market Power – The Possible Roles of TSOs in Monitoring for Market Power in Congested Transmission Systems", Report to the European Electricity Transmission System Operators, 2004.

3 As an example, a market monitor was in place at the Midwest ISO in the U.S. prior to the ISO (and the attendant markets) becoming operational.

*Note: As discussed above in the Executive Summary, this recommendation in its main parts was endorsed by the ECRB at the Athens Forum.*

***Coordinated Auction Issues***

The Coordinated Auction is currently being proposed for the SEE region as a way to advance the development of the region's electricity markets. It has important connections to market monitoring, including the following issues:

- The availability of auction clearing prices on the interconnections would provide increased transparency and would aid in market monitoring.
- The main aspects of the current interconnection capacity monitoring will remain valid to detect hoarding, unofficial usage, and deficient modeling assumptions and results.
- The allocation of coordinated auction revenue is an area where monitoring could be used to detect potential market power or market flaws. The main focus of market monitoring of the allocation mechanism is to detect adverse incentives and to provide market design recommendations.

*Note: As discussed above in the Executive Summary, the ECRB will consider at it September meeting whether the scope of the market monitoring project should be expanded to include the monitoring of the CAO.*

***Data Requirements Going Forward***

Our report explains the need to collect additional data going forward. We have already initiated requests for this data. These are:

- Physical (thermal) operating limits on interconnections
- The base case model used to estimate NTC;
- Details on daily transmission nominations; and
- Full Generator capacity and operating characteristics, including hourly output. Most of this will be outside of the control of the TSOs.

*Note: As discussed above in the Executive Summary, the ECRB has requested that we proceed with the two-year transition phase that relies only on public data. Accordingly, the requested data in the new phase of the project will be revised.*

**Organization of Report**

The remainder of the Report is organized as follows. In Section I we summarize our findings with respect to our monitoring analysis. This includes a summary of our data collection efforts

and a summary of our analysis and conclusions. In Section II we discuss the future monitoring activities, including the form and function of the monitoring and the data requirements for the next phases of the project. In Section III, we summarize of comments that were provide in response to the first draft of this report.

## I. PILOT PLAN FINDINGS

In the course of performing the monitoring functions under the Pilot Plan, we collected data from TSOs, who provide the core resources for this project both for data and for commentary concerning our analysis. We also collected certain public data. Using the available data, we developed analysis to monitor market activity and conduct. In this section we summarize our experience in data collection and analysis. In subsection A, we summarize our data collection efforts and results by describing the data sought and providing a checklist indicating the responses by each TSO. In Subsection B, we summarize our market monitoring analysis and the lessons learned in that process. In subsection C, we summarize other lessons learned that are not directly related to the actual analysis, but were revealed during our monitoring.

### A. Data Collection

*TSO-Provided Data*. With respect to TSO-provided data, the market monitoring Pilot Plan was developed in phases in order to respond to TSO concerns that immediate implementation of a full monitoring plan would unreasonably strain available resources. Therefore, the plan was implemented in three phases. Table 1 shows the data requested from the TSOs in each of the phases.

In general, we find the TSOs' responses to the data requests as favorable. One notable exception was Bulgaria ESO, which did not respond to our repeated requests for cooperation. Among the TSOs that have responded, many of them responded fully while others only partially. Table 2 shows the checklist summarizing the responses of each TSO.

## Table 1: Data Requested from TSOs

### Phase I: December 2006 - March 2007

Actual Load for each hour of the month
Actual Power Flow over each interconnection for each hour of the month
Unit Capacity characteristics for each control area generator

### Phase II: April 2007-December 2007

Incidence of Congestion Management actions
NTC and ATC on each interconnection after monthly auctions
Base Case Loopflow, Exchange, and Load data
Unit Capacity and operating characteristics for each control area generato

### Phase III: January 2008 - present

Operating Limits on Interconnections
Power Flow Case underpinning Monthly NTC Values
Day-ahead and day-of schedules on interconnections
Hourly Generation Data

*Note* : Data was requested for each month starting in January 2007 for December 2006 data. Data in an earlier Phase continued to be requested in latter phases.

## Table 2: Data Response Check List

| | Transmission System Operator | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Requested Data | Albania | Bulgaria | Bosnia & Herzegovina | Croatia | Macedonia | Montenegro | Romania | Serbia | UNMIK |
| Hourly Load | ✓ | **no** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Interconnection Flow | ✓ | **no** | ✓ | ✓ | ✓ | ✓ | ✓ | *Note 6* | ✓ |
| Generator Capacity Data | | | | | | | | | |
| Unit Rating | ✓ | **no** | ✓ | ✓ | ✓ | ✓ | *Note 5* | ✓ | ✓ |
| Outage Rating | ✓ | **no** | *Note 2* | *Note 2* | ✓ | **no** | *Note 5* | **no** | ✓ |
| Generator Operating Data | | | | | | | | | |
| Heatrate | *Note 1* | **no** | *Note 4* | *Note 4* | *Note 4* | **no** | *Note 5* | *Note 7* | **no** |
| Startup Cost | *Note 1* | **no** | *Note 4* | *Note 4* | *Note 4* | **no** | *Note 5* | *Note 7* | **no** |
| Fuel Cost | *Note 1* | **no** | *Note 4* | *Note 4* | *Note 4* | **no** | *Note 5* | *Note 7* | ✓ |
| Contractual Obligations | ✓ | **no** | *Note 4* | *Note 4* | *Note 4* | **no** | *Note 5* | *Note 7* | **no** |
| Hourly Data | | | | | *See Note 8* | | | | |
| Congestion Mgmt Actions | ✓ | **no** | ✓ | **no** | ✓ | ✓ | ✓ | ✓ | n/a |
| NTC and ATC | ✓ | **no** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | n/a |
| Base Case Data | ✓ | **no** | ✓ | *Note 3* | ✓ | ✓ | ✓ | *Note 6* | n/a |
| Operating Limits | | | | | *See Note 8* | | | | |
| Base Power Flow Case | | | | | *See Note 8* | | | | |
| Daily Schedules | | | | | *See Note 8* | | | | |

*Note 1* : Albania has only hydroelectric capacity in operaiton, therefore these data are not applicable; Note 2: Confidentiality generator data; *Note 3* : TSO referred us to UCTE; *Note 4* : TSO does not have data; Note 5: Confidentiality generator data; *Note 6* : TSO referred us to UCTE; *Note 7* : Confidentiality generator data; *Note 8* : These items are part of the Phase III request for which we are awaiting initial repsonses.

Phase III data requests were initiated in April 2008 and we have not received responses yet. Therefore, as noted, our experience in those categories of data is incomplete. In general, if an entry in the Table does not contain a check mark (✓), then the data was not provided and a *note* indicates any qualifying information. If only a "no" appears, that means the data was not provided without explanation or qualification. In some instances, this was the result of our not seeking additional clarification for the non-provision of the data, especially with respect to generator data which many TSOs did not provide. Indeed, as the Table shows, the generating operating data was the most difficult to collect from the TSOs, mainly because the data was unavailable to the TSOs or the generators requested confidentiality. Fortunately, the initial analyses under the Pilot Plan did not rely heavily on generator data. However, advances in our analysis will require more complete and detailed generator data, which we are seeking in Phase III.

The primary focus of the project has been the cross-border capacity analysis which relies critically on three data elements: (1) interconnection flow data, (2) NTC and ATC data, and (3) base case data. As the Table shows, aside from the complete failure of Bulgaria to respond, Serbia did not provide the interconnection flow data or the base case data. Croatia also did not provide the base case data. For both the interconnection flow data and the base case data, if one party to the interconnection provides the data, the analysis can be developed. However, the NTC and ATC data must be provided by both parties to the interconnection. Only Bulgaria did not provide this data and, accordingly, we could only achieve analysis of these interconnections by estimating key data points. This is a serious drawback, not only because we cannot fully complete our analysis, but also because publicly available ATC and NTC data is critical for market participants to gain access to the market. In this way, Bulgaria is failing to adhere to principles of competitive restructuring on the most basic level.

The other data impediment, less serious than the Bulgarian situation, was the lack of base case data from either Croatia or Serbia.[4] This prevented a full analysis of the Croatia-to-Serbia and

[4] Both Croatia and Serbia referred us to UCTE for BCE data. We have initiated an effort to procure this from UCTE. Serbia also referred us to UCTE for hourly physical flows and loop flows. Croatia did not respond to our request for base case loop flows.

Serbia-to-Croatia interconnections because we could not adjust the flows for loopflow and we had to estimate base case exchanges using seasonal values, as opposed to monthly values. The other interconnections involving Croatia and Serbia (except the Serbian interconnection with Bulgaria) can be fully evaluated using the data provided by the counterparty on the interconnection.

The generator data was used to some extent in the network model developed by REKK, as explained below. The missing data, primarily operating data (e.g., heat rate data) was not used directly in the analysis that was eventually included in the June-August Report. Initially, the data was requested in order to develop an accurate network model and also to develop an out-of-merit analysis (i.e., to determine whether country generator dispatch is conducted on a least-cost basis and not used to create congestion). As the data responses were received and it was apparent the data was not readily forthcoming, the analysis were delayed indefinitely. As explained below, we continue to seek generator operating data for these purposes.

Appendix A contains reports on the participation of each individual TSO with respect to data provision.

*Public Data.* We also collected data from public sources. This includes data from market operators in Austria and Romania and data from UCTE. The Austria and Romania data was used to provide a general indicator of regional prices. As it turned out, and as explained below, by studying the prices we found it also to be a useful indicator of regional market performance.

We also began using UCTE public data later in the monitoring project. While UCTE does not provide the monthly peak interconnection flows on its website, it does provide the monthly volume of interconnection flow. This data provided a basis for estimating the Serbian-Bulgarian interconnection flows. However, as explained above, the lack of ATC data from Bulgaria continues to undercut that analysis.

## B. Market Monitoring Analysis

Our monitoring of market activity and performance focused on three main areas:

(1) Overall Regional Market Outcomes (as indicated by prices and congestion);

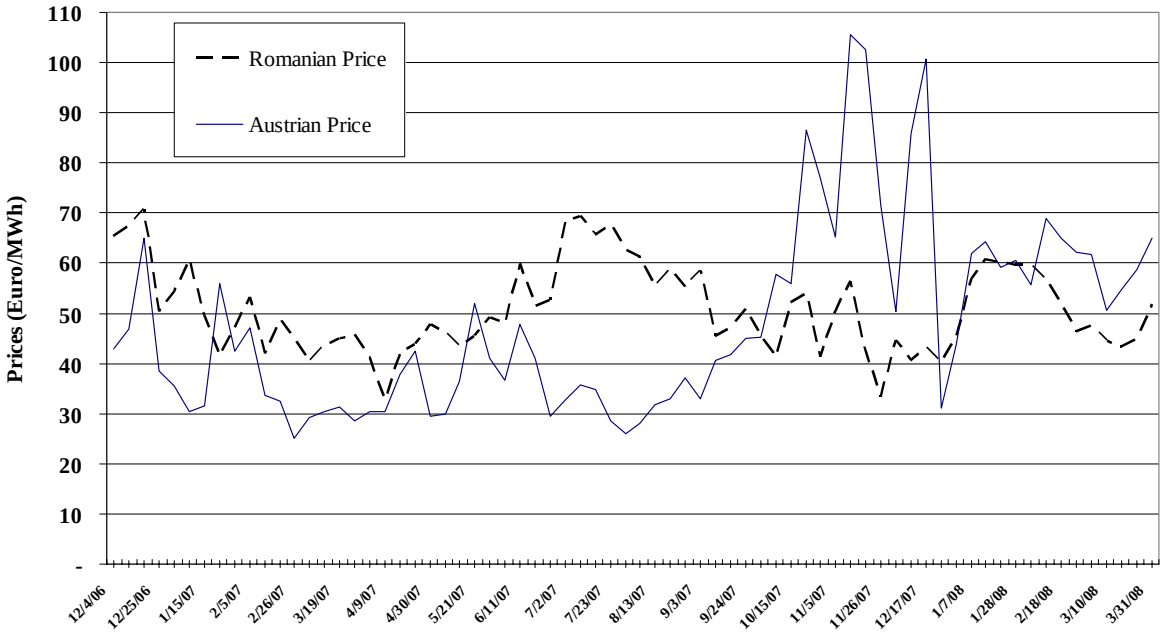
(2) Screening analysis associated with cross-border capacity allocation and usage (using line flow analysis); and

(3) Modeling of the regional network (for purposes of benchmarking)

### 1. Regional Prices

We track prices in Austria and Romania in order to monitor general market conditions. Our most significant observation has been that regional prices diverge significantly, with Romanian prices somewhat higher than Austria prices during the summer of 2007 and then the opposite relationship during the fall of 2007. This indicates some degree of market failure, either from congestion between the two locations or from the inability of market mechanisms to allow traders to arbitrage profitable price differences, so-called "seams". Figure 1 shows the comparison of Romanian and Austrian prices.[5]

**Figure 1: Comparison of Austrian and Romanian Day-Ahead Prices**
Weekly Average




5 We have received comments from some market participants that the Romanian price may not be a good indicator of the SEE regional spot price. However, given the lack of other price data, we will continue to track this price. We remain open to alternative price indicators.

We have anecdotal indications that the difference in prices could be the result of regional congestion. It could also be the result of "seams" between markets that make short-term trading too cumbersome to respond to temporary price differences. Given the potential efficiency gains, this area continues to be of market monitoring interest and we will continue to monitor the data.

## 2. Network Congestion

Network congestion is a critical issue in any electricity market. Accordingly, we collected indicators of congestion in the course of our monitoring. We identified congestion over both the planning horizon (week-ahead or longer) and over the operating horizon (day-ahead or shorter). Planning horizon congestion occurs when ATC on an interconnection is zero. This occurs frequently, especially in the southwest part of the region. Operating horizon congestion occurs when a TSO takes action to curtail transactions in the day-ahead or shorter time frame in accordance with UCTE congestion management procedures. Operating horizon congestion rarely arises; for instance between April and November, we had only one reported incidence of day-ahead congestion management actions. This was unexpected and we continue to be interested in the reasons why near-real time congestion is so uncommon.

Table 3 shows the ATC values for each interconnection for the twelve months beginning December 2006.

**Table 3: ATC Values on South East Europe Interconnections**

| | ATC | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Interconnection | Dec 06 | Jan 07 | Feb 07 | Mar 07 | Apr 07 | May 07 | Jun 07 | Jul 07 | Aug 07 | Sep 07 | Oct 07 | Nov 07 |
| Albania to Montenegro | 200 | 170 | 200 | 100 | 200 | 100 | 200 | 200 | 300 | 200 | 300 | 200 |
| Albania to Serbia | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 315 | 210 |
| Bulgaria to Romania | Unavailable | | | | | | | | | | | |
| Bulgaria to Serbia | Unavailable | | | | | | | | | | | |
| Bosnia & Herzegovina to Croatia | 50 | 380 | 460 | 345 | 410 | 425 | 425 | 650 | 570 | 410 | 387 | 440 |
| Bosnia & Herzegovina to Montenegro | 78 | 474 | 474 | 135 | 170 | 6 | 180 | 300 | 4 | 323 | 210 | 180 |
| Bosnia & Herzegovina to Serbia | 10 | 250 | 286 | 200 | 115 | 114 | 159 | 50 | 10 | 4 | 40 | 17 |
| Croatia to Bosnia & Herzegovina | 400 | 190 | 250 | 165 | 151 | 185 | 175 | 125 | 203 | 300 | 25 | 100 |
| Croatia to Serbia | 175 | 350 | 350 | 355 | 150 | 200 | 180 | 100 | 50 | 75 | 55 | 151 |
| Macedonia to Serbia | 150 | 220 | 75 | 175 | 105 | 60 | 135 | 105 | 25 | 0 | 90 | 130 |
| Montenegro to Albania | 87 | 75 | 100 | 0 | 35 | 0 | 0 | 15 | 0 | 100 | 100 | 100 |
| Montenegro to Bosnia & Herzegovina | 290 | 410 | 390 | 485 | 390 | 450 | 361 | 205 | 340 | 340 | 319 | 400 |
| Montenegro to Serbia | 450 | 500 | 400 | 270 | 270 | 130 | 210 | 215 | 220 | 150 | 470 | 230 |
| Romania to Bulgaria | Unavailable | | | | | | | | | | | |
| Romania to Serbia | 256 | 200 | 225 | 137 | 0 | 125 | 0 | 0 | 10 | 0 | 0 | 0 |
| Serbia to Albania | 55 | 55 | 55 | 55 | 0 | 105 | 0 | 0 | 0 | 0 | 0 | 0 |
| Serbia to Bulgaria | Unavailable | | | | | | | | | | | |
| Serbia to Bosnia & Herzegovina | 50 | 200 | 150 | 140 | 115 | 25 | 115 | 20 | 110 | 55 | 5 | 83 |
| Serbia to Croatia | 150 | 300 | 250 | 200 | 150 | 200 | 130 | 75 | 160 | 70 | 40 | 130 |
| Serbia to Macedonia | 30 | 130 | 170 | 124 | 0 | 150 | 0 | 0 | 0 | 0 | 0 | 0 |
| Serbia to Montenegro | 200 | 400 | 300 | 250 | 125 | 125 | 25 | 5 | 0 | 95 | 255 | 170 |
| Serbia to Romania | 190 | 50 | 75 | 75 | 35 | 50 | 75 | 0 | 0 | 0 | 50 | 35 |

*Note:* ATC Values reflect the result of monthly allocations. ATC for interconnections with Bulgaria were unavailable due to lack of data from this participant.

As the figure shows, ATC values can vary significantly from month to month. Such volatility can be caused (among other reasons) by changes in the patterns of purchases and sales by market participants. This is not necessarily a competitive concern. In an active market, patterns of commercial transactions can vary significantly. However, the volatility could be the result of the underlying capacity calculation, namely, the NTC value. Volatility in NTC values is not favorable to competitive markets, although some month-to-month changes are unavoidable because of seasonal changes in load and because of temporary outages on transmission and generation facilities. We analyzed the NTC values and found significant month-to-month changes. In particular, we found the average month-to-month change in NTC was 46 percent. We consider this to be significant. While we expect NTC to change slightly form month to month, it should be sporadic if it is related only to seasonal and equipment issues. However, we find changes in NTC to occur on a sustained basis over the entire time period. In nine of the eleven months the month-to-month change was greater than 20 percent and in six months it was greater than 30 percent. We do not find this consistent with the seasonal changes and random outages alone. Accordingly, we see a need to monitor the underlying assumptions and calculations of the NTC.

### 3. Cross Border Capacity Allocation

Power is traded among participants in South East Europe using cross-border transmission capacity. Therefore, the availability of cross-border capacity is critical to a vibrant regional market. Transmission capacity rights on interconnections that link TSOs in the region is allocated in accordance with procedures set forth by UCTE and endorsed by the European Transmission System Operators (ETSO). The procedures currently employed to allocate this capacity, known as the Capacity Assessment, is based on an estimate of the maximum potential power transfers between two TSOs. This estimates is derived from a "base case" power flow model that reflects anticipated load and generation conditions for the timeframe of interest, e.g., the month ahead. The input data includes the thermal ratings of transmission facilities, the forecast load, and the output range and costs of generators.

The underlying basis of the Capacity Assessment is the estimate of Total Transmission Capacity (TTC). TTC is the maximum possible flows that can be safely accommodated over the

interconnection given these base case assumptions about load, generators, transmission conditions, and scheduled transfers among TSOs (called *base case exchanges* or "BCEs"). Essentially, the TTC is estimated by modeling an increasing transfer of power between two TSOs and detecting the maximum transfer amount at the point where transmission constraints are reached. Net Transmission Capacity (NTC) is defined as TTC less Transmission Reliability Margin (TRM). TRM is a margin of cross-border transmission capacity that is reserved by TSOs in order to respond to operational uncertainties. It typically accounts for about 10 percent of the TTC, but can vary somewhat.

NTC is then divided between capacity that which is allocated through yearly and monthly auctions (Already-Allocated Capacity (AAC)), and Available Transmission Capacity (ATC). Hence:

TTC = maximal safe power transaction between two TSOs in the base case;

NTC = TTC -TRM;

NTC = AAC + ATC;

The Capacity Assessment estimates the maximum transfer between two TSOs without regard to the maximum transfers betweens any other TSOs. In other words, it is a *non-simultaneous* estimate of the maximum transfer capacity and does not account for the fact that the interconnection's physical capacity can be used up by transactions between neighboring TSOs (a phenomenon known as loop flow). This is the standard short-coming of *contract-path*-based estimates like those in the Capacity Assessment: the estimated transfer capability is estimated in isolation of transactions between other TSOs.[6] In reality, the estimated capacity on an interconnection could be substantially used up in real time by transactions on other systems and the actual physical capacity could be insufficient to accommodate all transfers. When this happens, real-time congestion management is necessary.

[6] This is mitigated somewhat by using base case exchanges in the TTC calculations, which are meant to reflect potential regional transactions.

The alternative to a contract-path-based system is a flow-based system where the transfer capability on an interconnection reflects the other uses on the system. In a flow-based system, all regional transactions are taken into account to determine the regional capacity that is available for a particular transaction.[7] In our analysis below, we highlight some of the differences between the contract-path-based allocations and flow-based allocations (which are under consideration in parts of Europe).

***Physical Flows, NTC, and AAC***

Our monitoring of cross-border transmission capacity focuses on comparing the physical usage of the system to the transmission capacity that is made available to the market. Our analysis seeks to illuminate the process of reserving and scheduling on the interconnections with the goal of identifying potential impediments to competition. Using values from the Capacity Assessment and data on actual physical flows, we seek to develop meaningful comparisons between reserved uses of the system (AAC) and actual physical flow. To do this, we calculate certain measures of capacity from a flow-based perspective. More precisely, we identify potential physical flows associated with the various contract-path-based estimates in the Capacity Assessment (viz., NTC and AAC) using Power Transfer Distribution Factors (PTDFs).

PTDFs indicate what portion of a transaction between two TSOs will physically flow over various interconnections. Typically, most of the physical flow associated with a transaction between two TSOs will flow on the interconnection between them. However, a significant portion can flow over other interconnections. For example, only 64 percent of a transaction from Serbia to Montenegro will flow on the Serbia to Montenegro interconnection. Seventeen percent of it will flow on the Serbia to Croatia Interconnection and ten percent will actually flow easterly to Romania.

Therefore, with respect to AAC, if all AAC on an interconnection is actually scheduled in real time, only a portion of it actually flows on the physical facilities. For example, if the PTDF on an interconnection is 60 percent and the AAC is 100 MW, then a maximum of 60 MW would

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7 The Coordinated Auction Office that is under consideration in the SEE region is a flow-based system.

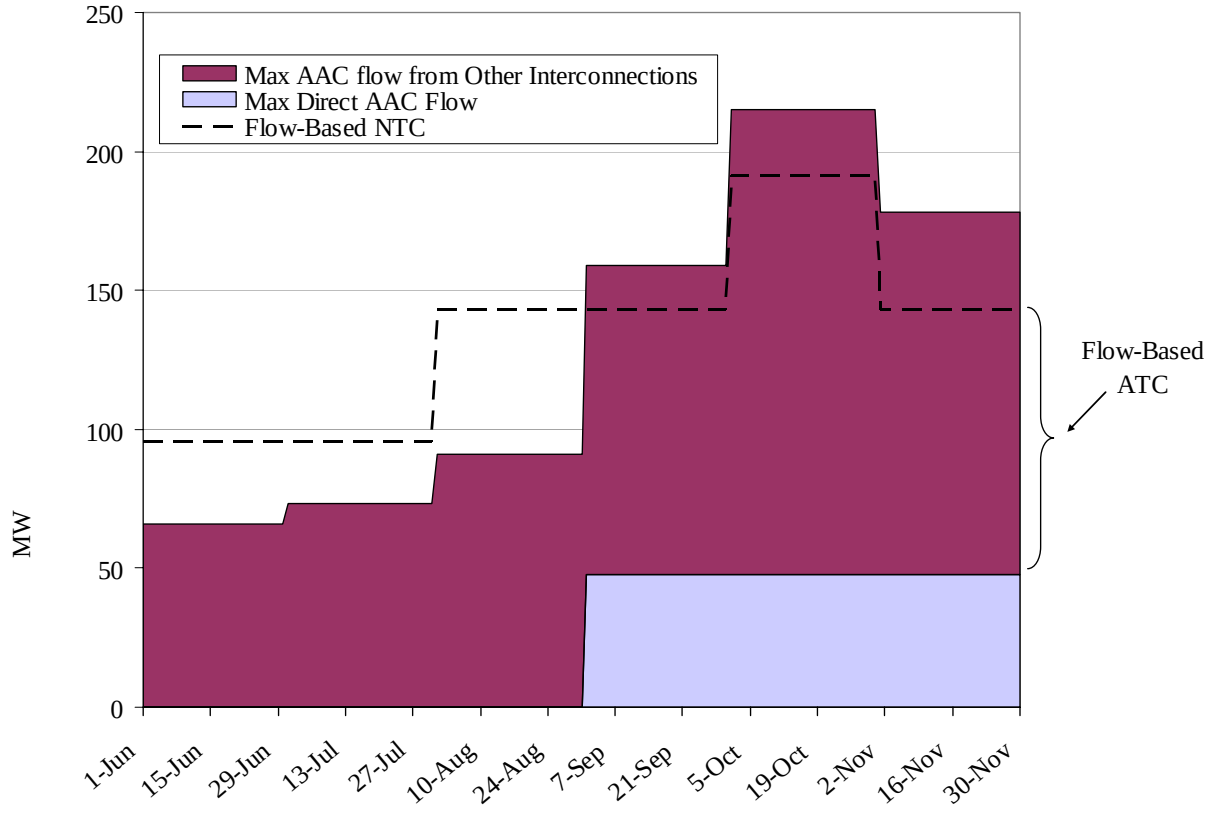
actually flow on the interconnection from those reservations. However, the interconnection would experience physical flow from AAC over other interconnections, i.e., loopflow. Accordingly, we use the AAC values on each interconnection to estimate the maximum flow from AAC by other TSOs. We refer to these measures as flow-based AAC values because they indicate the physical flows that would arise from the AAC if scheduled in every hour.[8]

We also estimate the amount of physical capacity that is available on the interconnection as determined by the Capacity Assessment. Recall that the NTC value produced by the Capacity Assessment is an estimate of the largest transaction that can be accommodated between two TSOs above the base case dispatch and base case exchanges (adjusted for TRM). Not all of the incremental transaction will physically flow on the interconnection between two such TSOs. The amount that would flow on the interconnection corresponds to the physical flow-based capacity available on the interconnection: NTC times the PTDF between the two TSOs. Hence, if the PTDF is 60 percent and the NTC is 50 MW, 30 MW of physical capacity is available on interconnection. We refer to this as the "flow-based NTC". A comparison of this flow-based NTC to the flow-based AAC discussed above provides important insight into the capacity allocation process in the region.

In order to clarify the nature of these metrics, an example from actual data is helpful. Consider the Albania-to-Montenegro interconnection. We choose this interconnection only because it is first in alphabetical order.

8 As explained below, we refer to these as "maximum" because we do not consider the physical flow from other interconnections that flow in the opposite direction (i.e., counterflow).

**Figure 2: Flow-Based AAC and NTC Values**
**Albania-to-Montenegro Interconnection**




The red-colored area is the Maximum flow associated with AAC from other interconnections (i.e., loopflow). It represents what would flow on the Albania-to-Montenegro interconnection if all TSOs with AAC on other interconnections that have positive PTDFs with respect to the Albania-to-Montenegro interconnections fully-scheduled their AAC. Using only TSOs with positive PTDFs in relation to the interconnection implies that no counter-flow is considered -- only physical transactions associated with AAC on interconnections that would flow in the Albania-to-Montenegro direction are included. This is why the term "maximum" is used. In most instances, of course, transactions that contribute to physical power flow in both directions will be in effect at any given time.

The lightly-colored blue area in the figure is the maximum direct flow associated with AAC on the Albania-to-Montenegro interconnection. It represents what would physically flow if all the reservations from Albania to Montenegro were scheduled. It is the "maximum" because we assume the AAC is fully scheduled. The sum of the blue area and the red area provides the

maximum potential flow over the interconnection. Hence, the top of the red-colored area represents the total maximum AAC flow.

The dashed line on the figure is the flow-based NTC. As described above, this is the maximum amount of physical capability that would be available to accommodate AAC. When the sum of the red areas and the blue areas exceeds the NTC flow, the interconnection is over-allocated. This would have been the case in September, October, and November. This is not unexpected because there is very little direct coordination of the AAC on different interconnections. In the event the actual flows associated with maximum AAC was realized, real-time congestion management measures would be necessary to maintain reliability of the system. This is not likely to be frequently needed because not all reservations are ultimately scheduled, and some schedules will provide counterflow and relieve the physical loading on the interconnection. This is the value of real-time congestion management – it allows the operators to respond to unforeseen circumstances, such as the event when schedules are heavily weighted toward reservations that contribute to flow in one direction.

In order to avoid encumbering the figure with additional data series (and potentially obscuring the results), ATC is not shown explicitly. However, as Figure 2 shows, the flow-based ATC is the difference between the Flow-Based NTC and the Max Direct AAC Flow.[9] Therefore, because ATC=NTC-AAC, when Flow-Based NTC equals Max Direct AAC Flow, then ATC is zero. When Flow-Based ATC is greater than Max Direct AAC, then ATC is non-zero. On this particular interconnection, ATC is greater than zero in each month.

The figure also reveals that outside transactions (red shaded area) have the potential to contribute to power flows in greater proportion than the direct transactions between TSOs (light-blue shaded area). Given the current system of allocating and compensating for transmission capacity, other TSOs' are using this interconnection for transactions yet not paying for it. Additionally, because ATC values generally ignore flows caused by AAC on other interconnections, the parties to an interconnection may post substantial ATC when the flow-

9 Actual contract-path ATC (the value that is posted on the interconnection) is the flow-based ATC divided by the PTDF between the two parties to the interconnection. Because this PTDF is less than one, this conversion results in an ATC value greater that the Flow-Based ATC.

based capability of the interconnection is already fully allocated. This is a standard shortcoming of the contract-path-based allocation methodologies (which are the dominant approach to capacity allocation throughout Europe) and is reminiscent of justifications for flow-based methods.

On each interconnection, we also compare actual physical flow to the implicit physical limit on the interconnection. The physical flows are provided by participating TSOs. The implicit physical limit is derived from the flow-based NTC and base case assumptions regarding "base loopflow" and exchanges. Recall that the flow-based NTC, which is shown in Figure 2 for the Albania-to-Montenegro interconnection, is the amount of additional physical flow that can be accommodated on the interconnection above the base case model. Therefore, the flow-based NTC plus any physical flows on the interconnection from the base case model represents the physical limit on the interconnection.

Physical flows on the interconnection in the base case rise from two sources: "base loop flow" and base case exchanges (BCEs). Base loop flows, called *natural flows,* are the flows on the interconnection in the base case prior to any exchanges between TSOs. It is the flow from the base dispatch. These values are provided to us by the TSOs on a monthly basis. In addition to the natural flows, we also account for flows on the interconnections resulting from the BCEs. BCEs are part of the base case model and, therefore, occupy physical capacity in the model. We received BCE data from the TSOs and, because they are reported as transactions between TSOs, we use the PTDFs to convert them to physical flows.

The sum of the flows from the natural flows and the physical flows from the BCE represent the base physical flows.[10] The flow-based NTC indicates the maximum amount of physical capacity available for incremental transfers beyond the base case. Therefore, the sum of flow-based NTC, the natural flows, and the PTDF-allocated BCEs, represents the implicit physical limit on interconnection. We call it an implicit limit because we have derived it from these underlying

[10] We treat negative values for natural flows as zero. Likewise, BCEs that have a negative physical flow (counterflow) on the interconnection are not included. Including negative values we would improperly under estimate the physical capacity.

values; as opposed to receiving such data directly form the base case models. However, we are in the process of requesting this data.

**Figure 3: Physical Flow and Implicit Physical Operating Limit**
**Albania-to-Serbia Interconnection**

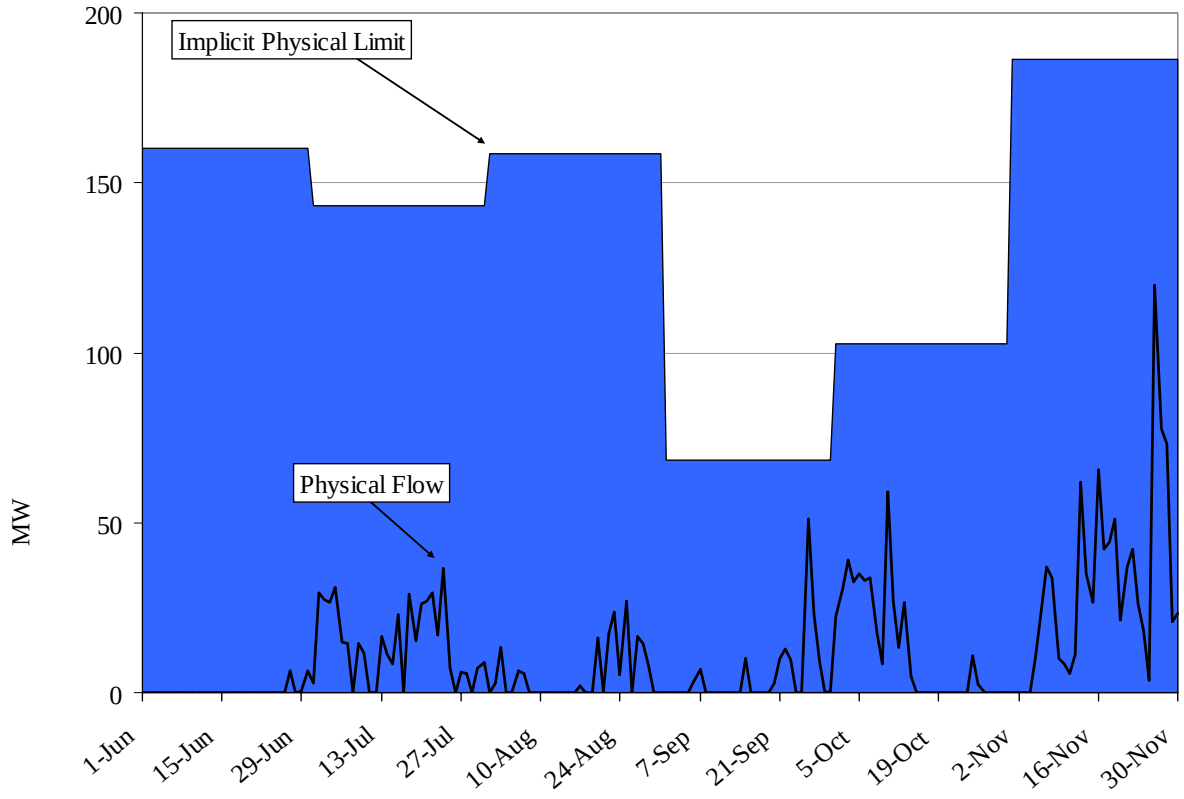



Figure 3 shows an example of our analyses on the Albania-to-Serbia Interconnection. We use this as an example because it is the first interconnection in alphabetical order that had non-trivial flows on the interconnection.

The figure is relatively straightforward. It shows the daily physical flows on the interconnection compared to the implicit physical operating limit. For this particular interface, the physical flows are within the operating limit. In the summer, the flows were somewhat below the limit. This could be explained by the unreserved capacity (i.e., positive ATC) that remained on the interconnection. If it had been the case that ATC was zero during time periods when flow was significantly below the physical limit, the data would suggest that ATC was hoarded. Alternatively, if NTC was close to zero, in indicates that additional transmission capacity could be made available in the Capacity Assessment.

The implicit physical limit on the Albania-to-Serbia interconnection, like other interconnections we evaluate below, fluctuates substantially, which may indicate potentially modeling concerns if it cannot be explained by changes in system topology. We seek physical operating data on each interconnection that will permit further evaluation.

We seek to identify three primary outcomes that have potential competitive or efficiency implications. The first outcome is one in which ATC and NTC is zero or close to zero while physical capacity remains unused. In such a situation, the unused capacity could be made available through ATC. The second outcome is one in which physical flows exceed both the physical limit and the maximum flow expected from AAC. Such a scenario would be consistent with unscheduled use of the system by parties within the region or excessive loop flow from outside the region. The third outcome is one in which the ATC is zero and the physical flows are close to or exceed the physical limit. On these interconnections, the transmission constraint is binding and, therefore, additional interconnection capacity would benefit the market. Accordingly, we recommend careful review of the Capacity Assessment in order to determine whether higher TTC values are possible.

We analyzed 20 interconnections.[11] Eight of these 20 interconnections were relatively inactive. The interconnections exhibited minimal or no reservations and little or no physical flow occurred in real-time. These relatively inactive interconnections are: Albania to Montenegro; Bulgaria to Romania; Bosnia & Herzegovina to Serbia; Croatia to Serbia; Macedonia to Serbia; Montenegro to Bosnia & Herzegovina; Montenegro to Serbia; and Serbia to Romania. These interconnections tend to be ones that serve power transactions in the west to east direction, which is against the predominant flow in the region. Our screening did not detect potential market or efficiency problems associated with any of these interconnections.

The other twelve interconnections were relatively active. Reservations and physical flows were significant. On five of these interconnections, ATC was non-zero and real-time physical flows were consistent with the reservations on the interconnections. These are Albania to Serbia;

[11] The two interconnections between Bulgaria and Serbia were not analyzed due to the lack of physical flow data from both of these entities.

Bosnia & Herzegovina to Montenegro; Croatia to Bosnia & Herzegovina; Montenegro to Albania; and Serbia to Montenegro. We do not find that the reservation or usage patterns on these interconnections raise competitive issues.

Of the remaining seven interconnections, there were results that raise potential concerns. On Serbia-to-Albania interconnection, significant physical capacity was available that was unused while zero ATC was posted, which indicates that ATC may have been underestimated or reserve but not used? On the other six interconnections, ATC was frequently zero and/or physical flows were significantly higher than what reasonable would be expected given the reserved capacity. These interconnections include Bosnia & Herzegovina to Croatia; Romanian to Bulgaria; Romania to Serbia; Serbia to Bosnia & Herzegovina; Serbia to Croatia; and Serbia to Macedonia. The potential concerns on these interconnections are of two types. First, the excess flow may be the result of unscheduled uses of the system or interregional loopflow that does not correspond to modeling assumptions. Second, because ATC is zero and flow is significant, careful analysis of the Capacity Assessment may be warranted to ensure NTC and ATC values are being maximized. While these results may be explained by operating and market conditions, they may also indicate potential efficiency issues or competitive concerns that warrant further investigation.

## 4. Regional Network Modeling

REKK has been developing a network model of the SEE region which combines a model of generation dispatch with a transmission network representation. The motivation for developing this model is to study a competitive benchmark for the purpose of future monitoring.

The following are the key observations from the modeling:

- Both Romania and Bulgaria are low-cost net exporters into the SEE region with relatively low internal market prices and congested borders. Reasonable changes in interconnection capacity towards the rest of the SEE region do not significantly affect prices in these two markets, as they are largely determined by domestic forces.
- Market prices in much of the central and western part of the SEE region are closely connected to the outside (“northwestern”) prices prevailing in the neighboring countries

for a wide variety of situations. Net exports are not unidirectional, but depend on the level of Hungarian and Slovenian prices even in the case of no congestion.

- Within the SEE region, a high-price congested sub-region consisting of Albania and Macedonia appears in certain situations. This is due to the insufficient internal generation capacity and relatively weak outside connections of these markets.

## C. Other Findings and Conclusions

### 1. Bilateral Contracts

Southeast Europe electricity trade is conducted primarily through bilateral contracts.[12] Accordingly, the key indicators of market performance will be indicated by the terms of bilateral contracts. We sought to determine the availability of bilateral contract data in each TSO in order to develop a strategy for data collection.

In general, two main issues arose. The first is that TSOs generally do not maintain the records of bilateral contracts. This is generally because they do not having the legal basis to do so. The second is that in instances where they do (e.g., Macedonia), prices are not maintained. Therefore, in order to obtain the data, the monitoring plan data requests would have to be expanded to the market operator in some countries and the regulators in others. But even this would fall short because prices are not recorded by all of these entities because of the lack of a legal basis.

In light of the general lack of price data on bilateral contracts, we will not move forward at this time on collecting bilateral contract data. We may advance additional data requests that clarify the issues further and provide a more detailed summary at a later point. We recommend a region-wide system whereby bilateral contract prices be recorded in a standardized manner so that competition policy can be advanced. The system established in Romania whereby a centralized bilateral contract market records prices and makes them public (albeit on an aggregated basis to meet confidentiality objectives) may be a good model.

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[12] Romania is an exception where there is an active day-ahead exchange and a centralized bilateral contract market.

### 2. TRM

We have not, up to this point, considered Transmission Reliability Margin (TRM) as part of our analysis. However, from a hypothetical perspective, unreasonably-high TRM values can provide the means by which cross-border capacity can be removed from the market. In a fully-developed market monitoring plan, TRM calculations would be monitored for accuracy. Going forward, we will consider whether and how to monitor TRM values.

## II. FUTURE OF MARKET MONITORING IN SOUTH EAST EUROPE

As the Pilot Plan enters its second year, the question arises as to whether and in what form the monitoring function should be instituted. Our recommendation is to continue the market monitoring through a two-year transition that would lead to a sustainable operations phase. We recommend implementation be carried out through the ECRB with support from the Energy Community Secretariat and contractors under the guidance of ECRB.

We first consider the rationale for continuing the monitoring and then consider how it should function.

### A. Basis for Continuation of Monitoring Pilot Plan

The underlying principle which informs the decision to continue market monitoring is the critical role that market monitoring plays in the effectiveness of restructured electricity markets. It is widely recognized that market monitoring is a critical component of effective competition.[13] Moreover, experience has shown that having a market monitoring function in place prior to the market restructuring is particularly critical:

> The United Kingdom … provides an informative example of an electricity market that began operation with an inadequate market monitoring process. In fact, a major motivation for the New Electricity Trading Arrangements (NETA) was to implement a stronger market oversight process… The United States (US) also had an inadequate market monitoring process at the start of its electricity re-

[13] See, *e.g*., Newbery, D., and R. Green, "Review of the Monitoring of Market Power – The Possible Roles of TSOs in Monitoring for Market Power in Congested Transmission Systems", Report to the European Electricity Transmission System Operators, 2004.

> structuring program. This allowed a number significant market performance problems to occur, including the highly publicized California disaster during the period June 2000 to June 2001, before the Federal Energy Regulatory Commission (FERC), the US wholesale market regulator, implemented significant reforms to its market monitoring processes
>
> "Lessons from International Experience with Market Monitoring", Frank Wolak, Center for The Study of Energy Markets, Working Paper #134, June 2004.

Accordingly, we see a benefit in continuing the market monitoring function beyond the timeframe of the Pilot Plan in order to ensure the market monitoring is in place prior to the market restructuring having been fully implemented. We recommend implementing a market monitoring function using screens, indices, and analyses similar to those in the Pilot Plan. While market monitoring is a critical element of restructuring and market monitoring should be implemented on an indefinite basis, we recommend extending the market monitoring in South East Europe by at least two years, with the assumption that it would continue afterwards. In the next subsection, we discuss the particular formulation of the market monitoring.

## B. Organization of Market Monitoring Function

In this subsection, we consider options and provide recommendations regarding the form and function of the successor organization to the current Pilot Plan. The topic prompts two main questions. The first is under what entity does the market monitoring function exist? The second, once the entity responsible for the market monitoring is identified, how would the monitoring function be organized within this entity? In setting out our vision for the future of market monitoring, we recognize certain factors that will shape our course. First, multiple organizations will be involved that will necessitate careful coordination. Second, it will take time to establish the capability to conduct the monitoring function. Third, the capability and authority of the various regional entities will be critical in determine the best way to proceed.

To address these questions, we identified four entities that have the potential to be involved in market monitoring responsibilities. These are: (1) ECRB; (2) the Energy Secretariat; (3) Coordinated Auction Office (CAO); and (4) an umbrella group of regional SEE country regulators. We discuss each below.

### *Energy Community Regulatory Board*

The Ministerial Council is an entity created under the Energy Treaty to ensure the Treaty's objectives are attained. It is the highest-level body under the Treaty and determines overall policy under the Treaty. The ECRB can be empowered by the Ministerial Council to take measures to carry out these objectives.[14] Article 18 of the Treaty specifically prohibits certain anticompetitive behavior:

> *Article 18 Section 1*. The following shall be incompatible with the proper functioning of the Treaty, insofar as they may affect trade of Network Energy between the Contracting Parties:
>
> (a) all agreements between undertakings, decisions by associations of undertakings and concerted practices which have as their object or effect the prevention, restriction or distortion of competition,
>
> (b) abuse by one or more undertakings of a dominant position in the market between the Contracting Parties as a whole or in a substantial part thereof,
>
> (c) any public aid which distorts or threatens to distort competition by favouring certain undertakings or certain energy resources.

The conduct specified in Article 18 is the kind of conduct that market monitoring seeks to detect and prevent. Accordingly, it would appear the market monitoring would be a legitimate function under the treaty and, accordingly, a "task" conferred on the ECRB by the Ministerial Council.[15] The treaty obligations apply to all participants in the Pilot Plan and, accordingly, all participants would be obliged to provide the necessary cooperation and support to the market monitoring project.

### *Energy Community Secretariat*

Under the Treaty (Article 67), the ECS is created with the responsibility to "review the proper implementation" of the treaty and submit annual reports to the Ministerial Council. It is empowered to carry out tasks conferred by the Ministerial Council, which can provide the

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[14] See Treaty Establishing the Energy Community, Articles 47-62.

[15] We recognize that market monitoring is not only implemented to detect anticompetitive conduct but also to assist in identifying and proposing improvements in market design. We find these goals also within the spirit of the Treaty and, thus, within the purview of the MC.

authority to conduct market monitoring. Like the ECRB, such monitoring would apply to all treaty SEE signatories and could be conducted by Secretariat Staff or by contractor or both. The Secretariat provides dedicated staff to implement ECRB activities.

***Coordinated Auction Office***

The CAO is under development to improve the efficiency of regional cross-border transmission allocations. There has already been discussion about unspecified monitoring of the CAO in the context of establishing this office, which is still ongoing. The monitoring of the CAO that has been discussed is limited to the processes specific to the CAO and do not include the broader range of market monitoring issues envisioned in the Pilot Plan. Accordingly, if the market monitoring would be established within the CAO, the scope of the monitoring likely would have to be expanded. Moreover, the CAO is not currently operating and, therefore, is poor candidate for taking over the functions in the near term.

The Coordinated Auction Office is proposed to be a business association and all parties would be bound by the by laws of the CAO. Therefore, if the CAO by-laws contain market monitoring requirements, we can avoid the issues of non-responsiveness to the market monitoring as we have experienced in the Pilot Plan, the most notable example being Bulgaria.

From an operational perspective, it is not clear under the CAO what structure would be in place for management and monitoring. The CAO is proposed to be a cooperative venture among TSOs. A monitoring function set up jointly by TSOs would have to be established in a manner to ensure independence. This likely would require a regional body, like the ECRB. This could also be done through a consortium of regional regulators. However, this has the draw back that all countries would have to provide the regulators with sufficient authority over TSOs as well as authority to enter into cross-border agreements. It is not clear this capability does or will exist.

***Country Regulators***

A consortium of regulators from each SEE signatory could be created and conduct the independent market monitoring. However, as indicated above, this would require regulators from each signatory to have sufficient authority over TSOs as well as authority to enter into cross-border agreements, something that is uncertain, if not doubtful. In this regard, the ECRB,

because it is an organization that is comprised of individual county regulators, would appear to be a superior option.

***Recommendation***

We recommend the monitoring project be initiated under the ECRB and that this be conducted through a combination of internal ECRB/Secretariat staff and outside consultants. We believe the ECRB and its place within the structure of the Treaty provides the most suitable location for market monitoring. As discussed above, the Treaty envisions the ECRB functioning under the direction of the Ministerial Counsel to ensure the objectives of the treaty, including ensuring competitive conduct with respect to cross-border trading.

Given the formative stages of the ECRB, the monitoring function is best implemented using a phased-in approach. We recommend a two-year phase-in to allow the institutional framework to develop that would be necessary to carry-out monitoring on a sustainable basis. This phased approach will also allow development of collaborative working arrangements and legal and technical relationships. Currently, the market monitoring pilot plan is conducted under donor support (USAID) at the request of the Athens Forum. This pilot plan is currently operated through outside contractors and is proposed that this be continued in the two-year transition phase.

The ECRB, with the ECRB Electricity Working Group being closely involved, would have the overall responsibility for the market monitoring. The Secretariat would provide the staff to execute the ECRB responsibilities in this regard. Initially, the Secretariat will request and collect data and coordinate communications and technical meetings among TSOs, regulators, and other interested parties. Data processing and technical analysis will be conducted by a consulting team with funding by USAID.

In the near-term, the current arrangement should remain in place until an operating basis is determined within the option proposed above. Even if one of the options above is agreed on in the near term, it will still require some lag to establish the necessary operations. During the interim, the current project could continue under USAID/NARUC auspices.

Financing for the market monitoring beyond the two-year transition could be derived in a manner similar to those proposed under the CAO. This is reasonable because the TSOs earn revenue from all market participants and all market participants benefit from market monitoring.

***ECRB Response to Recommendation***

Our recommendation was considered by the Energy Community Regulatory Board (ECRB) and the ECRB Electricity Working Group (ECRB EWG). As stated in the conclusions of the Athens Forum:

> The ECRB supports the enlargement of the market monitoring project to include […] CAO monitoring with [the] suggestion to enlarge the geographical scope of market monitoring to the participants in the future 8th region and CAO participants. The ECRB proposed only publicly available data to be used within the market monitoring according to data available by TSOs and in compliance with Regulation (EC) 1228/2003 and the Congestion Management Guidelines.

The ECRB also indicated that a final recommendation regarding the future of market monitoring plan will be considered at the September ECRB meeting.

We welcome this action by the ECRB and we look forward to working to offering our support in the implementation of the ECRB policies in this regard.

We welcome this action by the ECRB and we look forward to working to offering our support in the implementation of the ECRB policies in this regard.

## C. Data Requirements Going Forward

The Pilot Plan was initiated with the commitment to phase-in the monitoring function in order to avoid overwhelming the resources of the TSOs, who would be the primary providers of data. Going forward, a broader set of data will be required to achieve a fully-implemented market monitoring function. We have identified these elements and presented our idea at the Market Monitoring workshop in Budapest. We have already issued data requests that were formed by the input received at the Budapest Workshop and we are awaiting the initial responses.

The following is a list of those data requirements:

- Operating limits on interconnections;
- Base case model used to estimate NTC;
    - Due to our observations that NTC is extremely variable, and due to the sensitivity of the modeling process to changes in underlying assumptions, monitoring the base case assumptions can help determine the source of the variability.
- Details on daily transmission nominations
    - This data would help to better determine whether allocated capacity is being nominated. Our current analysis observes only reservation (AAC) and actual flows. The nominations would help clarify the usage.
- Full generator capacity and operating characteristics, including hourly output;
    - The dispatch of generating units can have a significant impact on the usage of transmission capacity. Unjustified departure from least-cost dispatch can cause congestion that can be subsequently exploited by generators. We can check the instances of out-of-merit dispatch and determine whether the event may have caused congestion;
- Bilateral Contract terms, including prices and counterparties;
    - Full collection of this data element will depend on our recommendation that a region-wide system for collecting this data be established;

*Note: As indicated at various points above, these data requirements are likely to change as a result of the actins taken by the ECRB at the 12$^{th}$ Athens Forum.*

# Appendix A

## Reports on Individual TSO Responses to Pilot Plan Data Requests

### Albania

The Albania TSO was among the most responsive of all participants. Each data item requested was supplied to the extent it was available to the TSO. Because Albania has only hydro electric pants in operation, specific generator operating data was not applicable.

### Bosnia & Herzegovina

Bosnia & Herzegovina TSO was among the most responsive of all participants. All data requested that was available to the TSO was provided. The exception in the case of Bosnia & Herzegovina was in the case of generator data. The TSO claimed the confidentiality by the generators.

### Bulgaria

Bulgaria has exhibited the least support among TSOs for the project and has not participated to any degree. Efforts to elicit the TSO's cooperation have been essentially ignored.

### Croatia

Croatia has substantially cooperated with the project. It has provided most of the key data. The main exception has been base case data. Croatia had referred us to the UCTE for this data. We will increase our efforts to secure this data from UCTE. Croatia has also not provided TRM data that was requested starting February 2008.

### Macedonia

Macedonia had been a highly cooperative participant in the Pilot Plan until December 2007. We have been unable to elicit a response to our past three data requests. Given the high level of cooperation from Macedonia up to that point, including thorough data responses, this is a disappointment. We still hope to engage Macedonia in the Pilot Plan as we move forward.

### Montenegro

Montenegro had been a reasonably cooperative participant in the Pilot Plan until December 2007. We have been unable to elicit a response to our past three data requests, going back to December 2007. Given the level of cooperation from Montenegro up to that point, this has been a disappointment. We still hope to engage Montenegro in the Pilot Plan as we move forward.

### Romania

Romania has been among the most cooperative and attentive participant in the Pilot Plan. We have only had claims of confidentiality with respect to generator data, which is common among many participants.

### Serbia

Serbia has cooperated since the inception of the plan. The Serbian TSO sends detailed NTC and ATC data. However, for the key line flow data and base case results, Serbia has referred us to UCTE for this data. We will increase our efforts to secure this data from UCTE. Aside from Bulgaria, only Serbia does not provide the line flow data. And Serbia joins only Bulgaria and Croatia in not providing the base case data.

### UNMIK

UNMIK, thorough KOSTT, has been highly responsive to the Pilot Project. However, the most critical data is not in the possession of KOSTT and, therefore, a meaningful analysis cannot be provided for KOSTT.

## Appendix B:

## Market Monitoring and the Coordinated Auction Office

A major project currently under way to advance the development of the region's electricity markets, and one which has important connections to market monitoring, is the development of what has become known as the explicit flow-based coordinated capacity auction, or simply the "coordinated auction". Because the project involves a Coordinated Auction Office, it is sometimes referred to as the Coordinated Auction Office (CAO) project. The coordinated auction is a method for allocating cross-border transmission capacity and is intended as an improvement over the current system where bilateral arrangements between neighboring TSOs determines how the capacity is allocated. This is typically accomplished using a unilateral auction where cross-border capacity is allocated at each border through an auction conducted by each party to the interconnection.

Proper implementation of the coordinated auction can improve the efficiency of cross-border transmission capacity allocation because it considers the anticipated flow of each cross-border transactions which increases the certainty of system usage and, therefore, allows greater system utilization.

Under the current system, a fixed amount of transmission capacity (the NTC) is allocated at each border under separate (albeit somewhat similar) procedures. Under the coordinated auction, interconnection capacity is allocated using a system where all requests are considered simultaneously. When a set of (simultaneous) requests breaches a transmission limit, the scarce capacity is allocated based on the portion of an individual transaction that is actually anticipated to flow on the constrained facilities together with associated bid price of the transaction. In particular, transactions with larger bid prices and smaller flow impacts on constrained facilities are given priority over transactions with lower bid prices and larger impacts.

In general, the existence of flow-based auction clearing prices on the interconnections would provide increased transparency and aid in market monitoring. The auction price on an interconnection should reflect the relative prices on each side of the border. Therefore, it would provide a natural screening mechanism for monitoring market prices and detecting anomalous behavior.

In addition, the main aspects of the current interconnection capacity monitoring will remain valid. A key input into the coordinated auction calculation will be the cross-border capacity limits, referred to as Border Capacity (analogous to the TTC under the bilateral auctions). These limits will likely be calculated by the individual TSOs (although centralized calculation in the CAO is possible).

The calculated border capacity will then be used by the CAO to implement the auction. Monitoring of these values as is currently the case under the Pilot Plan would remains important. The actual power flows will be compared to the anticipated power flows. The anticipated power flows will be estimated using the power transmission distribution factors (PTDFs), which determine the physical path of a transaction between two countries. Given all the accepted transactions under the auction (plus any base case and outside loop flows), the power flows on all interconnections can be estimated. Significant departure between actual and estimated flows could indicate competitive issues, such as hoarding, unofficial usage, and deficient modeling assumptions.

The allocation of auction revenue also is an area where monitoring could be used to detect potential market power or market flaws. The coordinated auction raises revenue from the accepted bids. This creates a pool of funds that needs to be distributed. The mechanism that will be used is not fully established at this point so market issues can only be identified generally.

Two general mechanism designs have been explored and it appears one of the two or a combination of the two will prevail. One mechanism is to allocate the revenue to the congested interconnections based on the marginal value of capacity at the interconnection. This is the "shadow-price" method and it has a strong appeal to economic theory because the revenues are allocated to the scarce resource. The second mechanism allocates revenue based on flows in the interconnection. This is a "usage-based" mechanism.

Under the shadow-price mechanism, revenue increases commensurate with congestion and is paid to the owners of the interconnection. Therefore, an incentive exists to understate border capacity and/or defer upgrades that could increase capacity. Market monitoring would focus on screens that could reveal such conduct. Under the usage-based system, the opposite incentive exists, that is, a country would wish to provide more border capacity to increase flows and earn

higher revenue even if no further investment is needed on the interconnection. The main focus of market monitoring of the allocation mechanism is to detect adverse incentives and to provide market design recommendations.