Discussion

J W Maragón Lima, Escola Federal de Engenharia de Itajubá (Brazil) - We would like to congratulate the authors by the interesting papers about this upmost subject. We would like to hear from the authors some comments about the following points:

1. The introduction of the interaction component to overcome the non-linearity of load flow problem seems very promising to deal with transmission transactions independently. But as this component has a minor importance based on Claim 2 (Part I), why do not continue to use DC load flow to allocate fixed charge related to active flow? On the comparison of the proposed method with MW-mile methods (Part II), it was stated that this interaction component is very large for stressed system. Do the authors have any experience with this pricing framework in actual systems? What is the real influence of this component?

2. In order to avoid netting problems it was proposed for a balanced multi-point transaction a discrimination in the generators and load. This approach seems not fair and has some difficulties in defining which generator will feed an specific load. Moreover, the netting effect which gives rise to the association effect [A] is an inherent feature of power systems. Also, counterflows play an important role in the minimization of transmission investment.


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Celso González and Hugh Rudnick (Universidad Católica de Chile, Santiago, Chile): The authors have done a worthy and timely work in developing a pricing framework for transmission and ancillary services, particularly the latter one. It is proposed that the pricing of the transmission grid be cost-based and the ancillary service generation (only load following service) be market-based, both of them according to the real use which is made of those elements. We tend to believe that both of them should be market-based, mainly because transmission could compete not only with other grids/lines but also with local generation. Furthermore, transmission may not always be considered a legal monopoly business (although it may be so economically speaking); hence conceptually would it still be valid to assume that proper pricing signals can be obtained from the proposed methodology?

Evaluating the actual use of each element by all participants in order to charge them, is a better approach than that of commercial or contract path pricing [A]. These last two pricing schemes clearly do not consider the actual operation of the system, and therefore do not allow for an economic and efficient use of the network elements. In order to evaluate this, the approach assumes that the power system is made up of many bilateral transactions. However, in practice there are power systems where the selling by generators is directly to a pool. Then, there is no clearly an identifiable end-user; furthermore this kind of operation could last for years. How then could this kind of transactions be taken care by the methodology? On the other hand, it seems to us that this approach, aside from identifying and evaluating usage of each element, can also serve to evaluate the economical benefits which participants obtain from each network component, an important issue in competitive environments [B].

In relation to the long term pricing of fixed cost for transmission and ancillary services for each transactions, we are not sure if the authors favor the use of equation (2), that is economy instead of efficiency.

How does your proposal deal with the counter flow issue? In regulations implemented in Argentina and Chile, generators contributing to reduce line flows do not pay for those lines.

We congratulate the authors for a well written contribution to unbundle the technical issues from the economical ones in a competitive deregulated power system.


[B] Rudnick, H., Cura, E., Palma, R., "Open access pricing methodologies in economically adapted electric transmission systems", V SEPOPE-Symposium of Specialists in Electric Operational and Expansion Planning, Recife, Brazil, May 1996

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A. A. Zobian and M. D. Ilić :

We thank the discussors for their interest in our paper. Their comments provide an important addition to this paper. We acknowledge that some of the points they raised are still controversial and open research questions. We respond to each discussor separately.

Dr. Maragón Lima:

The interaction component is relatively small under normal operating conditions, as stated in Claim 2; however, we are proposing that it should not be neglected. It may have minor impact during some periods but it will be of significant amount during high load times.

Concerning the comparison between a DC load flow-based MW-Mile method, on one side, and our proposed method, on the other, the importance of accounting for the interaction component is conceptual. It offers means of providing more accurate usage-based allocation of the cost than the DC-based MW-mile. This is because our method does not require assumptions typically made when a DC load flow analysis is done, such as independence of active power from reactive power and voltage changes and linearization of the real part
of the load flow equations. The result is that our method (1) does not assume that superposition of the effects of transactions holds, and therefore it captures the non-linear interaction effects caused by transactions, and, (2) it is capable of recovering cost of reactive power support by the transmission grid using similar principles as when recovering cost of real power support.

Concerning our experience with the proposed pricing methodology on actual power systems, we are currently testing this method on the New England Pool transmission system. The initial findings indicate that the interaction component could be as large as 10% of the transaction, and that the fixed cost allocation among different transactions and different companies can vary considerably as a function of the method used.

The netting problem is effectively equivalent to the counter flow problem. It is reflected in the fact that the actual transmission line flows caused by a set of simultaneous transactions, some of which causing flows in opposite directions, are smaller in magnitude than the sum of the flows caused by the individual transactions. Therefore, this results in less cost allocated to the set of simultaneous transactions, than the sum of the cost allocated to individual transactions. This property is an inherent feature of electric power systems. We have provided two possible approaches to reduce the severity of this problem in this paper. Also, it is likely that this issue would be reduced in importance by the forces of the distributed market; marketers will see an opportunity to determine most adequate sets of transmission transactions to minimize the cost of using the transmission system. Effectively, this process will continue until all options for cost reduction through aggregation are used.

The importance of the role that counter flows play in minimizing transmission system investments is basically case dependent. They play an important role only when the power flow, on a congested line, is reduced enough to avoid making a new investment. Also, if the system is dispatched economically, then counter flows are fiction that does not relate to actual flows on the system. Finally, many well designed systems do not have very pronounced counter flow, since few transactions (close to none) exist in a direction from low generation cost areas to the high generation cost area. It is not clear, however, how would the flow patterns change under a complete open access, with physical bilateral transactions, including retail wheeling. In this case transmission investment and its dependence on counter flows must be studied further.

**Mr. Gonzales and Prof. Rudnick:**

We believe that transmission is a natural monopoly and should remain under some form of regulation. We would not recommend to use fixed cost recovery approach to price transmission services under competitive transmission markets.

The question concerning the mechanics of mapping our proposed pricing scheme into the real-time operations, is an important question that was not explicitly described in our paper. Our model, as pointed out by the discussors, requires an identifiable end-user for both generation and demand for long term transactions, however, in our model the pool balances the short-term market only and does not participate in selling energy in the long-term market. In this case, energy transactions that go through the pool are short term transactions and are priced at the SRMC of power at that bus (spot price). The cost of serving each bilateral transaction is bundled, i.e., it consists of the cost associated with power provided to the individual transaction, and, in addition, of the transmission costs determined by the spot price.

Regarding the efficiency issue versus economy, we point out that no claims on long-term dynamic economic efficiency could be made using our proposed method. This is an inherent feature of all pricing methods that are based on fixed cost recovery. Further work needs to be done on this topic.

Finally, regarding the impact of counter flows on our pricing method, we respond as follows: It is proposed to charge each transaction independently from the actual flow direction. The proposed formulae are based on the absolute values of flows. One rationale for this comes from the fact that in the absence of transmission line constraint, a counter flow does not give any added value to the transmission system (neglecting the effects of losses, which is treated as negative losses, and a counter flow transaction is rewarded for reducing the losses as part of the ancillary services charge). Furthermore, rewarding counter flows for transmission service may provide a significant basis for gaming and manipulating the system by informed users at the expense of other users. Some rewarding mechanism should be developed for counter flows that reduce transmission congestion.