Hogan and Harvey's "Comments on the California ISO's NewGen Policy": Reply

California ISO
Department of Market Analysis

1. Overview

This note analyzes and responds to the criticisms advanced by Scott Harvey and William Hogan (H/H) of the California ISO's New Generation Connection Policy (NewGen), in comments attached to the protest by the Coalition Supporting Pro-Competitive Interconnection Policies to Amendment 19 to the California ISO's Tariff. The H/H critique has three primary elements:

- NewGen communicates inaccurate and inappropriate price signals to suppliers and users of generation and transmission;
- NewGen creates barriers to the entry of new generation, and discriminates in the prices seen by new and old generation; and
- the criteria and procedures proposed by the ISO for the management of NewGen are unworkable.

The third criticism is essentially an implementation issue and is not the subject of this note. The first two critiques, however, attack the fundamental design of NewGen, arguing that NewGen is fatally flawed as an economic policy and represents a wrong turn in the development of California's deregulated market for bulk power, transmission, and ancillary services. These two criticisms are the focus of the present discussion.

H/H compare the outcomes that they assert that NewGen would produce with the outcomes of their preferred market design, characterized by locational pricing at nodes on either sides of congested transmission paths, so that zonal markets for energy implicitly price scarce transmission capacity in the presence of congestion. In the context of the California market, H/H argue for the creation of a priced zonal interface whenever the spatial pattern of generation and load requires full use of the available transmission capacity. H/H analyze NewGen as a mechanism to avoid congestion entirely, so that a market mechanism for allocating scarce transmission is not necessary. From this avoidance of market mechanisms, in the H/H analysis, the two primary flaws--of incorrect price signals and of discriminatory treatment of new and old generators--flow.

H/H develop their argument through an extended analysis of an example of the entry of a new generator with the following characteristics

- The new generator (*North GenCo* in the H/H example) is the low-cost generator in the market;
- The new generator interconnects through a node (*A* in the example) that also connects other generators to the market's main loads;
- This connecting node is connected to another node (*D* in the example) to which most of the market's loads, and some generators, are connected;
- Prior to the connection of the new generator to the grid, the transmission path between the connecting node *A* and the load-serving node *D* is uncongested;
- Unless transmission lines between nodes *A* and *D* in the example) are reinforced, the new generator and the incumbent generators that share node *A* cannot simultaneously generate at economic levels without causing congestion on the path between *A* and *D*; and
- Ownership of the generation connected to loads through *A* is too concentrated to allow the ISO's intrazonal congestion management procedures to be followed.

H/H work through this example to support their claims that NewGen is a fatally flawed policy. However, their analysis does not take into consideration the economic behavior of the market participants that share the connecting node *A* with the entrant. H/H focus on a case when entry is efficient but transmission reinforcement is not. The central claim of the H/H critique is that "the NewGen policy [...] would make such entry unprofitable unless the full costs of the entrant, *plus the full costs of the transmission expansion*, are less than the avoidable costs of the incumbent." (H/H, page 3; emphasis in original). H/H recognize that this strong proposition depends upon the provisions of the NewGen policy that allow the entrant to arrange for mitigation measures, such as agreements to reduce the output of incumbent generators to make room for the entrant generator. They assert that these mitigation measure "are also anticompetitive, inefficient, and non-comparable," leading to discriminatory pricing and inaccurate locational signals to both load and generation.

The analysis of mitigation is central to the H/H critique. However, their analysis is incomplete and incorrect, since it does not analyze the behavior of market participants who could provide the necessary mitigation. The results of such an analysis, which is missing from the H/H critique, are that in the NewGen equilibrium, in which all market participants maximize profits,

- the effective prices for marginal changes—in production, consumption, and generation and transmission capacity—that are observed by all market participants are the same as the prices produced by well-functioning nodal auctions;
- because of the accuracy of the effective price signals, investment decisions—in generation, in siting, and in transmission capacity—are identical to those responding to the prices produced by well-functioning nodal auctions; and
- because of the accuracy of the effective price signals, real-time decisions to generate and, possibly, use energy are identical to those responding to the prices produced by well-functioning nodal auctions.

One of the primary tasks of this reply to the comments by Harvey and Hogan is to state and establish, and describe various implications of this proposition: that the equilibrium under the NewGen policy is the equilibrium under a well-functioning nodal-pricing arrangement, with the same resulting investments in generation, transmission, and congestion-mitigating load, and with the same patterns of real-time generation and load. The second primary task considers the specific implementation of price-discovery mechanisms in the context of the California marketplace. The mechanism preferred by Harvey and Hogan, the open auction to establish locational prices, is an effective mechanism only if there are sufficient participants to make an auction work. If, as is the case when the NewGen will apply, there could be few participants in such an auction, the iterative-negotiation mechanisms of NewGen is a more effective mechanism for price discovery.

NewGen is, in fact, nothing more than one institutional implementation of an open-access locational-pricing arrangement to guide investment, production, and consumption in the bulk power industry, that will work under conditions where the centralized nodal-pricing arrangements propounded by Harvey and Hogan will fail. It is not an open-auction implementation; instead, it relies on iterative negotiations among market participants, informed by the administrative and engineering processes of the ISO. There is no basis for a claim that open auctions are the preferred model for the discovery of efficient prices and welfare-maximizing investment, production, and consumption decisions.

There is one underlying economic analysis of network pricing. One may share the Harvey and Hogan's fundamental agreement with this model, without sharing their enthusiasm for a specific implementation—nodal auctions—under actual conditions of imperfect competition. The California ISO's NewGen policy is, under those specific conditions, a superior implementation, better adapted to producing the locational (effective) prices that are essential for a well-functioning network market. In the natural evolution of the California marketplace, and under the California ISO's Tariff, an auction-driven zonal structure may well evolve as the principal mechanism for finding and communicating the price signals to guide investment and production decisions. However, in the real world of the California industry, congestion in most areas is rare, and the locations where it is most likely to arise populated by a small number of generators; under these circumstances a negotiated implicit nodalism, as embodied by the NewGen policy, is superior to an unworkable auction design. California's adoption of the NewGen policy is in fact a victory on the west coast for the vision of a market-driven electric power industry, characterized by open access, decentralized decision-making, and the efficiencies of a competitive marketplace.

The remainder of this reply is organized as follows. In section 2 the equilibrium under NewGen is described, taking into account the mitigating options available to load and to incumbent generators, and illustrated using a generalized adaptation using the example proposed by Harvey and Hogan. Section 3 analyzed the implicit price signals to different market-participant classes that the NewGen equilibrium produces. In section 4, the institutional-choice decision is visited, comparing the negotiations implied by NewGen to the open-auction institutions promoted by H/H, with specific consideration given to the conditions of imperfect competition that call NewGen into force. Section 5 is a conclusion.

2. Equilibrium under NewGen

Under NewGen, the ISO has determined that there is insufficient competition to permit its market-based intrazonal congestion procedures to work successfully, and that new zones cannot be created immediately. Under these circumstances, NewGen offers the potential entrant several options, including: reinforcing the transmission grid to eliminate congestion; accepting the costs of intrazonal congestion management that result from its entry; curtailing its own generation when necessary to eliminate congestion; and making bilateral agreements with incumbent generators to curtail those generators when necessary to prevent congestion.

Transmission reinforcement may be a viable option in an auction-driven multizone equilibrium. It can also be a part of a NewGen equilibrium. Regarding an entrant's option to accept responsibility for the incremental costs of intrazonal congestion management, in general, intrazonal congestion management will be a high-cost solution, as it causes a scarce resource, congested transmission, to be unpriced. Furthermore, as H/H point out (page 26), the lack of workable competition that is associated with the invocation of the NewGen policy may permit gaming of the adjustment bids used in intrazonal congestion management, leading to high costs to the entrant. Self-curtailment of the entrant is also unlikely to be a part of an optimum: in an efficient equilibrium low-cost units will be generating, and high-cost units will be off.

All of the options offered to the entrant are voluntary. NewGen does not impose transmission reinforcement, acceptance of the costs of incremental intrazonal congestion management, or self-curtailment of the new generation. Instead, these options, any of which may be consistent with an entrant's decision to invest in new generating capacity, bound the terms which the entrant may accept in its negotiations of bilateral mitigation arrangements with incumbent market participants. The latter option is, indeed, the logical focus of an economic evaluation of NewGen. The other three options generally constrain the outcome away from the nodal-pricing equilibrium that is a first-best outcome under certain strong conditions of economic theory. But the outcome produced by zonal-nodal pricing is within the set of outcomes that may be negotiated under the fourth option. The primary question for economic analysis is whether those negotiations will tend to produce that outcome. The central proposition of this section, and indeed of this note, is that in fact these negotiations will produce the desired outcome. The negotiated equilibrium will reproduced the same set of investments in generation and in transmission capacity, and the same set of generation (and loading) decisions through time. A corollary to this proposition, which will be discussed in section 4, is that the price signals seen by various classes of market participants, including load and generation in different locations and potential investors in additional transmission capacity, are the same (although less visible than prices produced by open and public auction mechanisms).

The argument that the NewGen equilibrium is in its essentials identical to the zonal-nodal pricing equilibrium has a number of steps. First, the assertion is made that the configuration of investment and generation in the zonal-nodal equilibrium is one of the configurations that may be arrived at under the negotiations of the NewGen bilateral mitigation provisions. Second, a set of bilateral agreements is identified that is consistent with the proposed NewGen configuration. Third, it is shown that any set of bilateral agreements that does not produce the proposed configuration can not be an equilibrium: a further bilateral arrangement is possible that makes one party better off, without making the other party worse off. Thus, any equilibrium set of bilateral agreements must produce the proposed NewGen configuration, which is identical to the configuration resulting from the open-auction zonal/nodal pricing procedures promoted by Harvey and Hogan. Finally, the characteristics of an equilibrium set of bilateral agreements are shown to result in price signals to market participants that are identical to those produced in the open-auction zonal/nodal pricing equilibrium.

Nothing in the NewGen policy prevents an entrant from investing and negotiating to arrive at an outcome where it makes the same investment and production decisions as it would have under an open-auction zonal-nodal pricing regime. It is certainly possible that the other participants will not agree to such a configuration, or that their agreement would, under some circumstances, make the investments impossible, such as by requiring mitigation prices that were so high as to make a potential entrant's investment financially infeasible. However, the set of investment and production outcomes that characterizes the zonal/nodal equilibrium cannot be ruled out. The only question is whether it will be produced by the NewGen policy.

The NewGen equilibrium is discussed in the context of a slight extension to the example proposed by Harvey and Hogan. The extension involves specifying that the full cost of reinforcing the transmission path between nodes *A* and *D* in their example could be financed by a charge of $12 per megawatt of capacity expansion. In the simplified presentations of a zonal-nodal equilibrium, it is implicitly assumed that a potential investor in capacity can forecast the stream of congestion rents that would call forth this investment. In the real world, it may be that a generator who seeks access to a high-priced energy sink is better able to observe and respond to this signal than is some other class of transmission investor. However, for the sake of illustration we may accept that future congestion rents provide an strong investment signal, and adopt the generalization in our use of the H/H model.

This general example thus differs from Harvey and Hogan's primary example, illustrated in Figure 4 of their Comments, in that the cost of transmission reinforcement is set at $12/MW, so that in addition to the price-driven termination of *West*'s generation, there is an investment in an additional 10 MW of transmission capacity. Thus, in the equilibrium both *South* and *North* generate at capacity, there is a 135 MW flow from node *A* to node *D*, and a price differential of $10/MW is established between the clearing price of energy around *D* (at $40/MW) and the price at *A*. If the same production decisions were reproduced under NewGen, there would be no visible price differential, since the curtailment of *West* would be negotiated without recourse to adjustment-bid or other energy-pricing auctions, but otherwise the equilibrium would look very similar. It is shown in Figure 1.

[Figure 1. NewGen Equilibrium with Inactive Intrazonal Congestion Management]

Faced with generating costs of $20/MW and revenues of $40/MW, *North* can reinforce the transmission line by up to 60 MW, and still make a contribution to its fixed costs. However, it might also pay *West* to reduce its output. *West* is better off curtailing for any payment greater than the $10/MW differential between its generating costs and the energy price. However, if *West* recognizes that it offers *North* its only alternative to $12/MW transmission reinforcement, it may be able to cause *North* to pay very close to $12/MW for its mitigation services. There is no better option available to *West*; when taking into consideration *West*'s profit-maximization decision, it is evident that it will agree to mitigate every time.

In the NewGen equilibrium, the new generator *North* has gross revenues of $3,400 (85 MW times the $40/MW energy price), from which it subtracts $120 for a 10 MW reinforcement of the transmission path and $600 for curtailment of *West*, for a net revenue (before generation costs) of $2,680. The price signal to the entrant to connect through *A* is therefore about $31.53/MW, greater than the $30/MW signal produced by the zonal-nodal equilibrium. However, its marginal price signal is less: it is the $28/MW it would receive from net of the necessary marginal reinforcements of the congestion path. This is an appropriate marginal signal, as it reflects the value of energy at *D*, adjusted for the cost of delivering that energy.

3. Locational Price Signals under NewGen

Harvey and Hogan have asserted that the NewGen policy causes discriminatory pricing. From the standpoint of economic efficiency, price discrimination is not necessarily a bad thing. An economist's analysis of the efficiency impacts of a set of pricing must focus carefully on whether accurate price signals are being passed to marginal decision-makers. In particular, will a set of prices cause the least-cost providers of marginal services--whether generation, transmission, or congestion-mitigating load--to actually provide the marginal services? This is where a concern for price discrimination properly enters: it is important that there be no discrimination amongst classes that causes a violation of this fundamental principal. Thus, to evaluate the H/H price-discrimination criticism, the flows of funds, and the marginal price signals observed by different market participants, are analyzed.

It is important to recognize that a property right has been created under the NewGen policy: incumbent users of a transmission path have priority usage of a path. When there is congestion, that priority becomes binding, and owners of that priority receive a congestion rent for their ownership of the priority. At the same time, users of the path pay an explicit or implicit rent for their use of the path. This is no different from the circumstances under a nodal-zonal pricing scheme. The only difference is in the assignment of the property right (which is to the initial transmission owner under zonal-nodal pricing) and in the institutional arrangements for the discovery of the congestion rent. Under NewGen, an incumbent who continues to generate is both a rentier and a rent-payer. As a generator, its price signal for marginal generation is delivered energy price less its rent payment; as a rentier its rental receipts, which it earns whether it generates or curtails in favor of another generator, are the (possibly entirely within-firm) rental payments.

In the example, in the NewGen equilibrium there are 185 MW of locational assets: 135 MW of transmission capacity, and 50MW of load. *South* has 100 MW of this asset; *North* has the rest, of which it bought 50 MW from *North* and created an additional 10 MW through reinforcement of the path. Both *North* and *South* face the same marginal price signals: each sees a generation price net of congestion rents of $28 (assuming that *West* managed to extract a $12 mitigation-rent payment from *North*.

The existing load at *A* did not do well under the NewGen, as compared to the zonal-nodal equilibrium: it sees no benefit. However, the gain to the *A* load under zonal-nodal pricing is nothing more than another locational rent: under zonal-nodal pricing, load was made better off with no change in its behavior. Transfers of pecuniary gains--rent shifting--are not a primary concern of welfare economics. However, if load can increase--provide mitigation services--it can share in the market for locational assets. Under the NewGen policy, load can effectively create a locational asset, which it can sell to an actual or potential generator through side payments for mitigation. Thus, the price signal to the location of incremental load is, again, the price of energy at *D*, less the rental it can earn. If load is highly price elastic, it may render entirely unnecessary the reinforcement of the transmission path. In any event, the locational price signals to load are the same as those produced by the zonal-nodal auction regime.

4. Institutional Implementations of Locational Pricing under Imperfect Competition

The task facing the California ISO in its design of policy governing new connections to the transmission grid is essentially the same as that facing it in its other market-design tasks: to develop rules that contribute to efficient investment, production, and consumption decisions. The California restructuring seeks wherever possible to accomplish this task through the establishment of market mechanisms that drive market participants to reveal their costs, and to use these revealed costs to drive economic decisions. Where possible, the preferred market mechanism to drive this cost revelation is the open-access auction. However, formal auctions are not the only market mechanism that can perform this function, nor necessarily the best mechanism. In particular, an auction with one or two bidders may well provide singularly unreliable signals, particularly if the auction lacks any kind of iterative feature.

It is not necessary to describe a particular game that one or two participants in an adjustment-bid auction for congestion-relieving decrements might play. If the auction takes place within an existing zone, as part of the ISO's existing intra-zonal congestion management procedures, there is sufficient evidence on the ground that such games will be played. In an interzonal auction, the strategies may differ, but one can immediately observe that two generators bidding for space on a congested line may well be able to act in implicit concert to keep their generation just below the level where congestion rents are identified, or equivalently set adjustment bids at a high level, so that the resulting congestion charge is low or negligible. It is not at all clear that the transmission prices produced by such an auction will have much correspondence to the relative costs of generators on either side of the path, or necessarily describe the cost structure of participants on the surplus-energy side of the path.

In such conditions, the implicit iterative auction of negotiations for mitigation may well provide a more accurate set of price signals. The entrant (*North* in the example) can go back and forth amongst the various bidders for mitigation services, and is more likely to work towards the true least-cost provider(s) of mitigation.

The resulting prices, and price-discovery process, is certainly less transparent than the prices and process of the open auction. However, transparency is not an end in itself. Rather, price transparency is a means to the same end, the competitively-derived cost-based bidding of the economic optimum, that the more opaque processes of iterative bidding may, in these circumstances, more reliably achieve.

5. Conclusion

The ISO's policy was developed through exactly this sort of iterative negotiation, a process that brought to agreement all of the stakeholders with a clear interest in the policy. The negotiation in particular was supported by the transmission owners, whose rentier status under an explicit interzonal process was willingly negotiated away. Perhaps loads served within the "generation bump" were left out: those loads also stood to earn locational rents under a zonal system. But incremental loads in the generation bump are not left out: such potential loads face an implicit price signal that is just as favorable as the explicit signal they would face under a zonal pricing signal. Generation on both sides of the path, load on the energy-deficit side, and potential investors in transmission capacity, face the correct location-specific price signals.

It should be emphasized that the policy is not designed as the final step in the long-term transmission and congestion management, and generation-siting, processes. Rather, NewGen covers a particular circumstance: connection when intrazonal congestion management is not feasible and the creation of a new zone is not justified. The latter judgement, which might be based in part on explicit transaction costs, in part on the implicit transactions costs associated with the use of auctions in very thin markets, is not easily addressed by the analyses of simple economic models. In these cases, economics has traditionally fallen back on the Coasian prescriptions: assign property rights to scarce resources, and as a default judgement trust in the workings of the market.

Absent a clear showing of a barrier to entry, a showing which has not been made, there is no reason to depart from this default position.