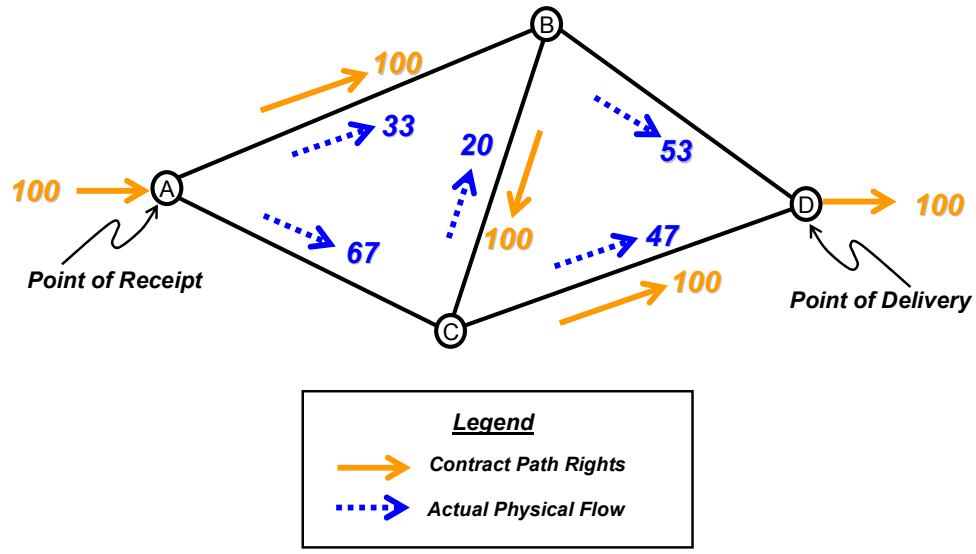
## Drafting Proposal Supporting Document

## Types of Transmission Rights

### Contract Path Rights

The traditional form of transmission rights provided are called Contract Path Rights. In these contracts, Points of Receipt (POR) and Point of Delivery (POD) are named in the contract where the transmitting party accepts energy from and returns energy to the customer. The transmission right is described in terms of specific facilities over which energy is assumed to flow. In Figure 1, a 100 MW right is shown with A as the POR, D as the POD and the contract path on the facilities A-B, B-C and C-D. In the Western Interconnection, the links may be described as individual lines or transformers, or they may be Rated System Paths, i.e., sets of parallel transmission facilities that have been given a combined rating. For a transmission customer's schedule to be accepted by control areas, it must have a continuous contract path between its POR(s) and POD(s).

***Figure 1***
***Contract Path Rights***




Although the contract specifies a path, the actual flow of energy through the transmission system is dictated not by the terms of a contract but by physical characteristics of the interconnected transmission facilities. In Figure 1, the physical components for a 100 MW schedule from A to D are shown by the dotted arrows. Power flow in all the lines in the system is affected by this schedule, with the greater flow on the lines with lower impedance[1].

[1] Impedance is the technical name for the combined effects of resistance and magnetic induction effects which inhibits flow on a line in an AC transmission system. In DC systems, such as a automotive wiring harness, only resistance is present. The flow of power on lines in an interconnected AC system is inversely proportional to their relative impedance. In simpler terms, this

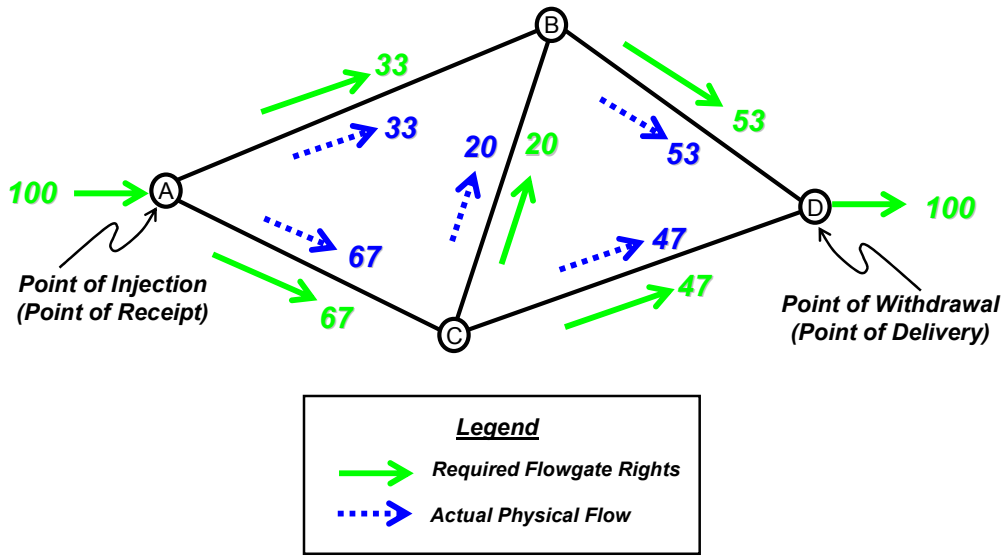
The mismatch in flows between of the assumed flow on contract path and the actual path has been called loop flow (or parallel-path flow). For instance, the flow on line C-D is 47 MW and not the 100 MW assumed by the contract. There is no schedule on line B-D, so the 53 MW flowing on the line is loop flow.

Under current practice, the contact path schedule cannot exceed the physical capacity path, even if the actual flow is well below the path's rating. This rule provides the margin necessary to allow operation of separate, independent control areas that do not see flow effects prior to real time. This results in lower utilization of capacity than would be possible under a single control area. For instance, if the rating of A-B is 100 MW, no more power can be scheduled from A to D in Figure 1, even though only 33 MW is flowing. The physical system could handle 300 from A-D if the actual flow was limiting, but the WECC rules prohibit added schedules to provide a reliability buffer.

## Flowgate Rights

For many years, there has been a national debate about how to best correct the flaws in the contract path right model. An approach used in the RTO West Stage 1 Proposal, was the use of Flowgate Rights (also called Flowpath Rights). Under the Flowgate Right model, a transmission customer must own rights for each element on which its power will flow equal to the distribution of its schedule over the transmission lines of the system.

***Figure 2***
***Flowgate Rights***




means "the big pipes get more flow and the little pipes get less, but all pipes are affected by every schedule to a greater or lesser degree."

Figure 2 shows that this aligns the actual flow and the scheduled flows, however the customer must have a bundle of rights on all facilities. The list of right required for a 100 MW schedule from A to D is:

- Path A-B, 33 MW
- Path A-C, 67 MW
- Path B-D, 53 MW
- Path C-B, 20 MW
- Path C-D, 47 MW.

There are a number of implementation challenges associated with the flowgate model. In a large scale system, there are thousands of individual lines on which rights would be required. To make the implementation easier, the number of facilities on which flowgate rights are required is usually limited to those on which "commercially significant congestion" is expected to occur. This is often done by defining a set of zones bounded by the identified critical facilities, where congestion is not expected to occur. This introduces inaccuracy, because congestion which does occur within the zones is ignored, so the problems of the contract path model persist within the zones. Any change in system configuration will change the flow path requirements. For instance, if Path C-B is out of service, flow automatically redistributes over the remaining lines according to the laws of physics, and a new set of flowgate rights are required. Assuming the new flows are A-B-D = 45 MW and A-C-D 55 MW when path C-B is out of service, then the customer must try to buy an addition 12 MW of rights on path A-B and 8 MW of rights on path C-D. The effects might be ignored under a rule for temporary outages, but the same kind of problem will occur when any new transmission is added. At that point all the transmission rights must be redistributed between the parties, either administratively or by auction.

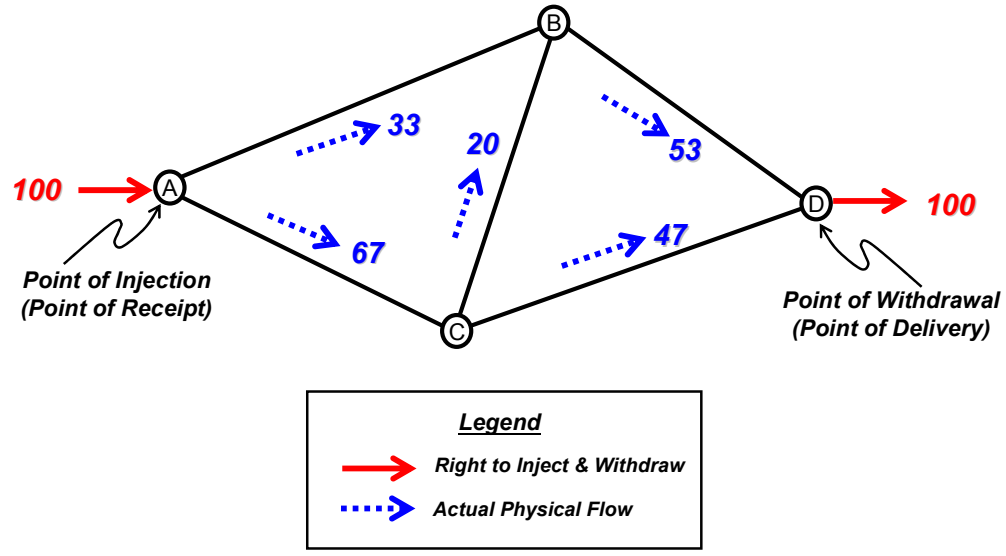
Probably the greatest challenge of the flowgate model is that encountered in trying to make the move to it from the contract path model. It is very difficult to translate existing contract path rights to flowgate rights and allow right holders to retain the same transmission value under the new model. In a large scale system like the Northwest, flows from one schedule on a line are often displaced by flows from another schedule. A given path will have both negative and positive components of low, with the sum of all components on a given facility being within the ratings. However, when an attempt is made to convert contract path rights, the contract right holders do not want to give up the right to counter flows, because they may be needed at some time. For instance one of the "netted out" parties is not scheduling, a party may need flowgate rights it did not need when a counter schedule was present. The complexities of the flowgate model, led the RTO West parties to abandon it in favor of a financial rights model.

## Physical Injection/Withdrawal Rights

The form of rights proposed for new rights in the initial stages of Drafting Team Proposal are Physical Injection/Withdrawal rights. As shown in Figure 3, the transmission customer has the right to inject and withdraw energy from the system a specific locations. These Points of Injection and Points of Withdrawal are equivalent to the PORs and PODs of the contract path model. Restating contract path rights as part of the inventorying process, simply identifies the POR to POD rights and tabulates them. The flow of energy through the

system is not defined as part of the transmission right, instead the management of flows within the system is left to the system operators.

***Figure 3***
***Physical Injection/Withdrawal Rights***




Recall that under the Contract Path Model, neither the flow nor the contract path schedule could exceed the rating of a facility, which leads to under-utilization of capacity. Under the flowgate model this barrier to usage is eliminated, since the schedule on a line is its actual flow, but it required the transmission customer to know the distribution of its schedule over each path and manage rights associated with those paths. For the Physical Injection/Withdrawal model, the schedule is also the actual flow, but it becomes an operator to operator activity which defines interconnection schedule. This can be shown from Figure 3, but assuming that there are two control areas X and Y, with node A and path A-B in control area X and the other nodes and lines in control area Y. Paths A-B and A-C are thus interconnection tie-lines. The transmission customer's 100 MW schedule (A-B, B-C and C-D) is converted to an injection of 100 MW at A and a withdrawal of 100 MW at D. Under an operator to operator agreement, this schedule entered into the two operators records as 33 MW on path A-B and 67 MW on path A-C. Added flow can now be *scheduled* on path A-B to move more energy from A-D.

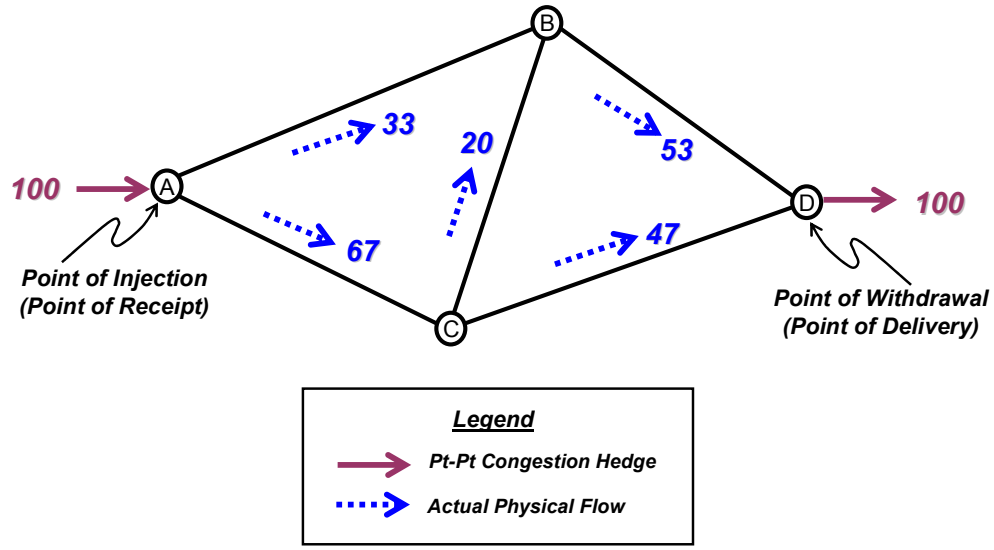
While the Physical Injection/Withdrawal model makes it possible to inventory contract path rights with minimal confusion, the direct trading of the Physical Injection/Withdrawal rights in a secondary market will be limited. Only parties with the same set of injections and withdrawal points can make a direct exchange. The rights can be traded through an auction which uses a security constrained dispatch type protocol for reconfiguration of rights. For instance a request for a injection at A and withdrawal at B, can be satisfied by release of a right to inject at A and withdraw at D, however this release will not be a MW for MW match, because the relative flow on C-B will be much higher for an A-B schedule than an A-D schedule. This 10 MW released from A-D will provide fewer than 10 MW for an A-B request,

if C-B is constrained. Nevertheless, by aligning flows with schedules, more capacity can be made available, and a transmission auction can be created to facilitate trading of transmission rights.

## Financial Transmission Rights

The RTO West Stage 2 Proposal proposed the use of financial transmission rights, Financial Transmission Options (FTOs) and Catalogued Transmission Rights (CTRs). The Advanced Target State for the Drafting Team Proposal anticipates movement from Physical Injection/ Withdrawal rights when markets are operating and locational price signals are available to transmission system uses. Under a financial transmission right, the transmission customer has a point-to-point transmission hedge whose value is equal to the difference in locational price between the point of injection and the point of withdrawal.

***Figure 4***
***Financial Transmission Rights***




In the example shown in Figure 4, the transmission customer schedules a 100 MW injection at A and a matching 100 MW withdrawal at D. Assume that the locational prices are $30 and $45 at A and D respectively, the transmission customer would be charged $1500 for congestion ($15 x 100 = $1500), but since it has a 100 MW A-D right, the $1500 would be immediately credited in the settlement process. Thus, the financial outcome is the same as would occur under other transmission right models. For the Stage 2 proposal, the value of a FTO as a credit against congestion cost can be applied to alternative injection and withdrawal points. Because the value of a transmission right is settled in dollars, direct secondary trades between parties are enabled. The use of financial transmission rights presupposes the existence of energy markets which produce the necessary locational prices. By delaying the move to financial rights until after these markets are operating,

transmission customers will have a price history which can be used to guide their transmission right conversion decisions. (It should be noted that under the Stage 2 proposal, conversion of pre-exiting transmission rights was voluntary. This same voluntary conversion principle applies to this proposal.)