



Selecting A Flow-based Method for Issuance of Transmission Rights

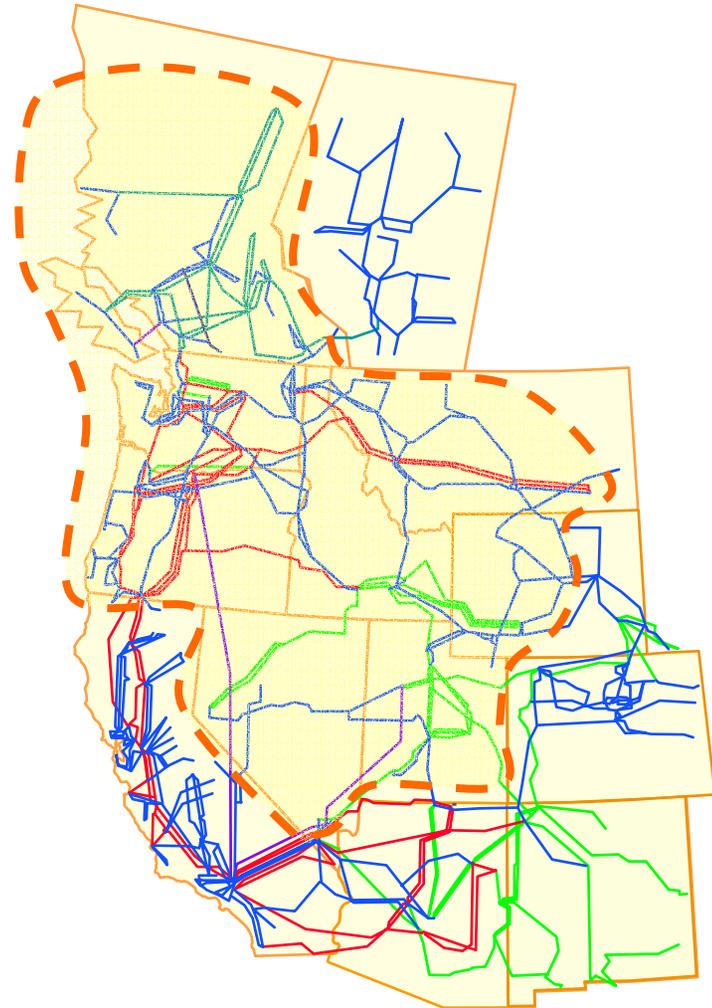
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For OATI Flow-based Informational Forum
Minneapolis, Minnesota
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What is Grid West?

- **An independent transmission provider to be filed under Order Nos. 888/889 as an improvement to the OATT.**
- **Over 62,000 circuit miles of transmission lines**
- **Includes most transmission facilities shown in this region :**
 - Avista Corporation
 - Bonneville Power Administration
 - BC Hydro & Power Authority
 - Idaho Power Company
 - Nevada Power Company
 - NorthWestern Energy
 - PacifiCorp
 - Portland General Electric Company
 - Puget Sound Energy, Inc.
 - Sierra Pacific Power Company



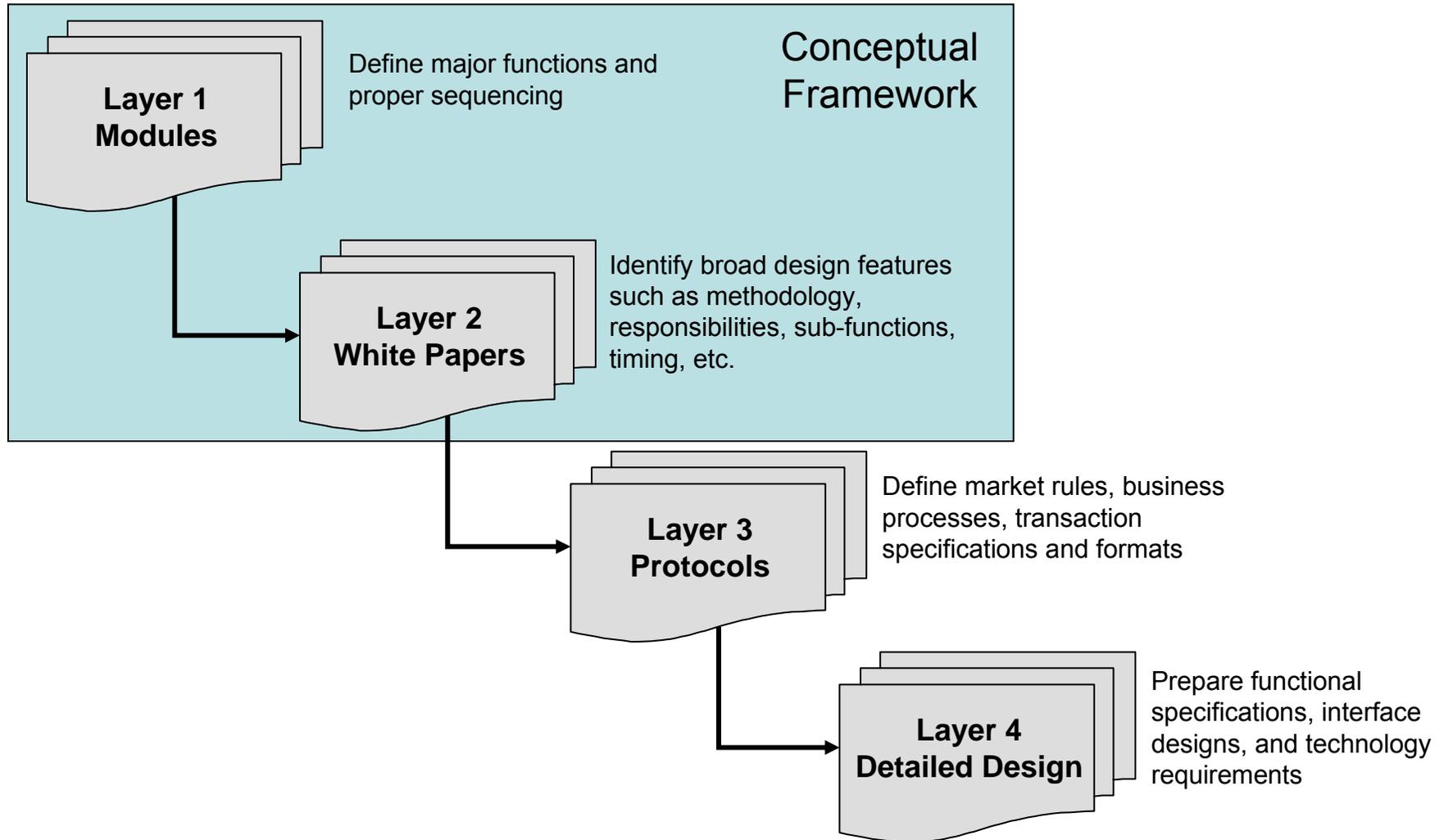
Note: The Grid West proposal is designed to accommodate participation by Canadian transmission owners and operators in British Columbia and Alberta.



General Features

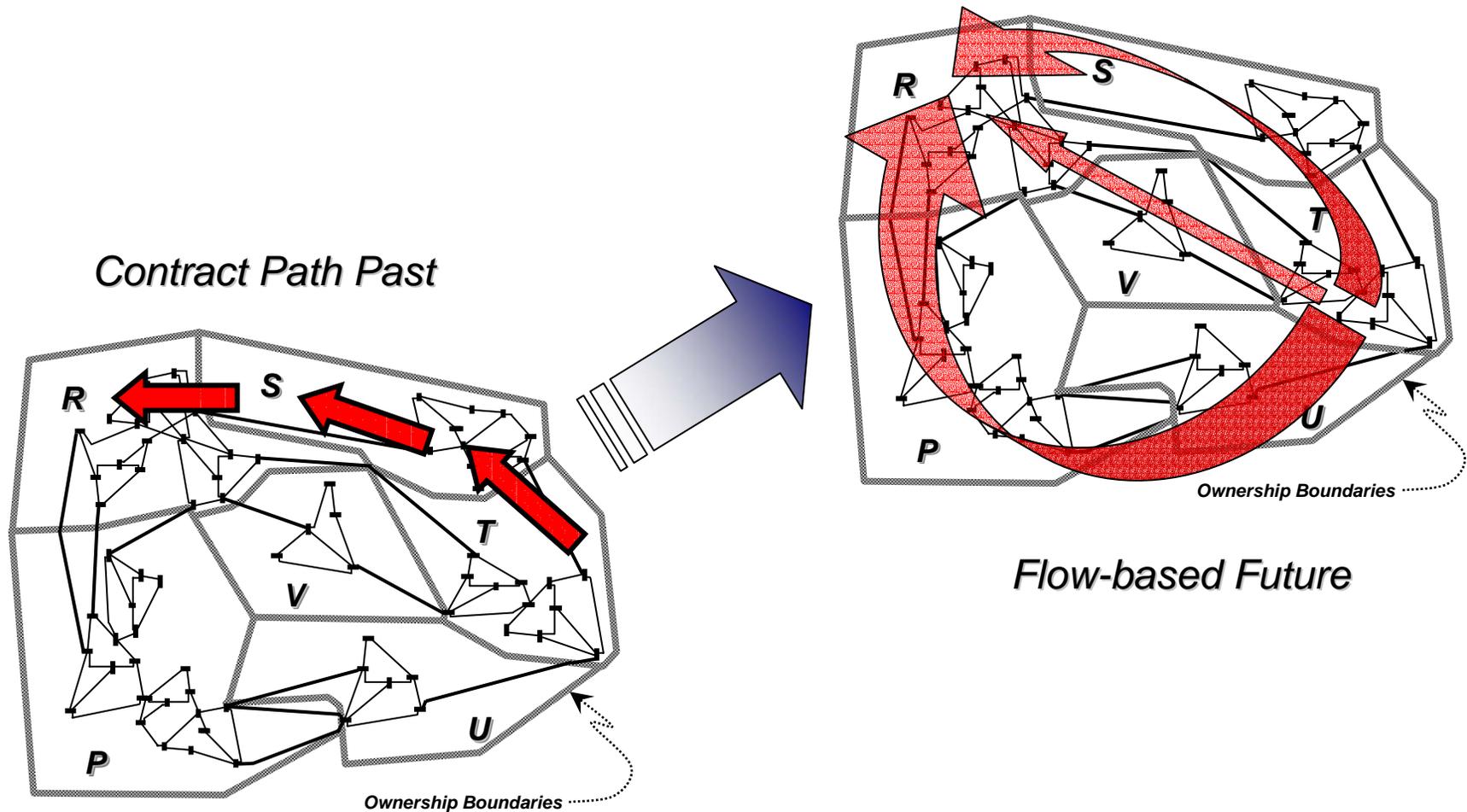
- **Developed to meet a set of problems and opportunities identified by the region in order to:**
 - ✓ Meet the need for transparency and independence.
 - ✓ Address current rules and practices that prevent full system utilization.
 - ✓ Eliminate pancaking impediments to efficient, region-wide transactions.
 - ✓ Resolve operational challenges of loop flow, curtailments, etc.
 - ✓ Provide for expansion of transmission infrastructure.
 - ✓ Provide an independent market monitor for the region.
- **Grid West is an integrated proposal:**
 - ✓ All elements united in a single entity.
 - ✓ Governance balances independence with regional responsiveness.
 - ✓ Operational design meets region's functional needs and supports voluntary, organized markets.
 - ✓ Pricing design eliminates rate pancakes and recovers transmission cost.
 - ✓ Provides estimated benefits and costs.
 - ✓ Identifies budget and funding for next development steps.

Development Process: A Layered Approach





A Key Principle: Moving from Contract Path to Flow-based





Flow-based vs Contract Path Transmission Rights

- **Contract path (or ownership based) method:**
 - ✓ Appeal:
 - Fits our standard property right models of divisible ownership and usage.
 - Is embedded in hundreds of contracts.
 - ✓ Challenge:
 - Misalignment of capacity management (transmission rights) with the actual use of the network
- **Flow-based (or physics based) methods:**
 - ✓ Appeal:
 - Imputed impacts of usage more closely aligned with actual physical impacts.
 - A higher degree of usage is enabled by reducing the margins needed to allow for autonomous actions of individual owners.
 - ✓ Challenge:
 - Protecting existing transmission usage rights.
 - Convincing owners to yielding control to centralized administration of rights.



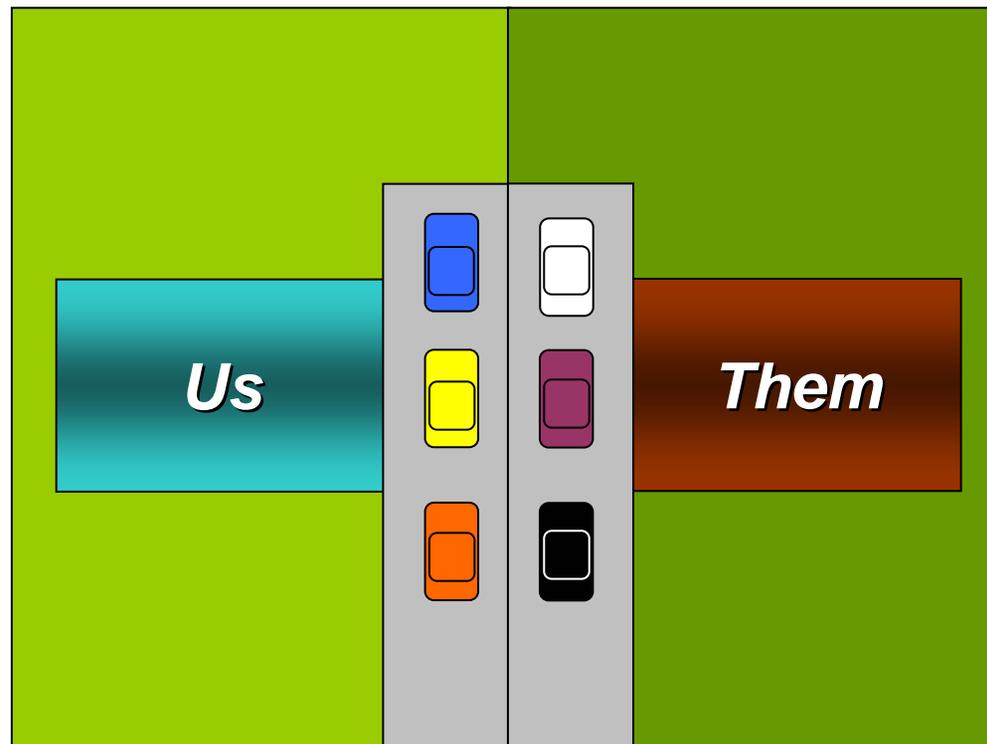
Using a Single-system Point of View

- **Interconnection Effects:**
 - ✓ The interconnection of transmission systems creates a much larger single-system.
 - Each party's actions affect all other parties.
 - Effects occur simultaneously and instantaneously, so divisibility of autonomous action not really possible.
 - The attempt to treat the system as semi-discrete units requires leaving margin in the system to allow for autonomous action.
 - ✓ A piece-meal approach to usage of transfer capability leaves capacity on the table.
- **Taking a single-system viewpoint:**
 - ✓ Brings usage management in line with system physics.
 - ✓ Permits more effective management of transmission system capacity using a flow-based methodology.



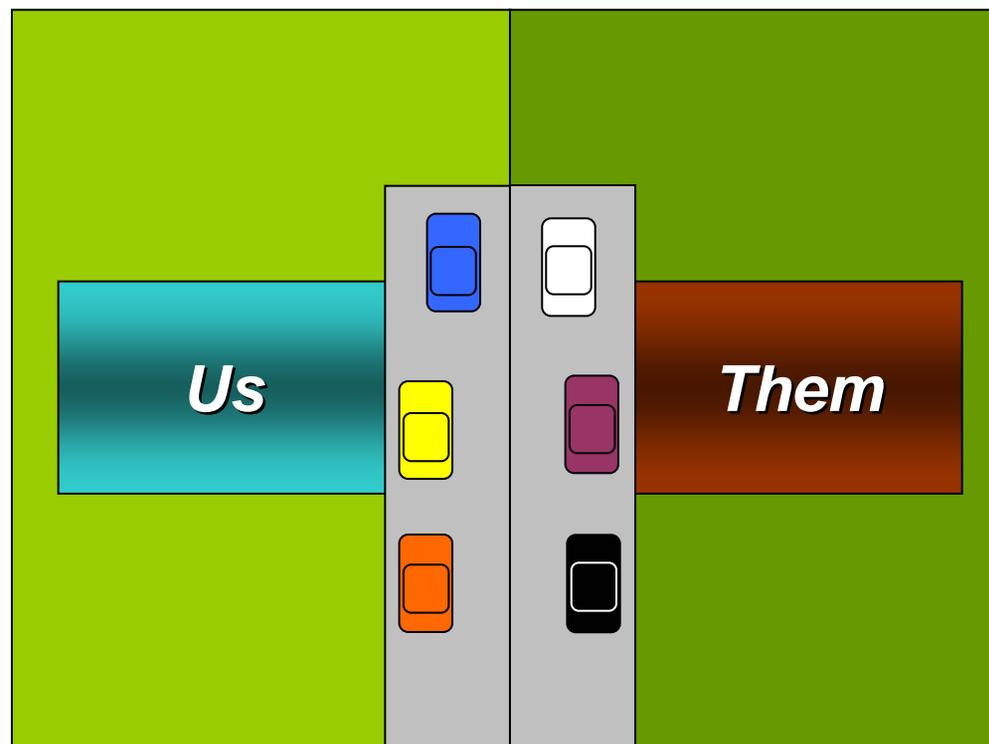
An Example: Best Use of a Joint Investment

The Problem: Getting the blue car to go to work when everyone else at your house is still in bed...



Benefits of Using a Single-driveway Model

A Solution: Agree that it is really one driveway and change the parking arrangements...



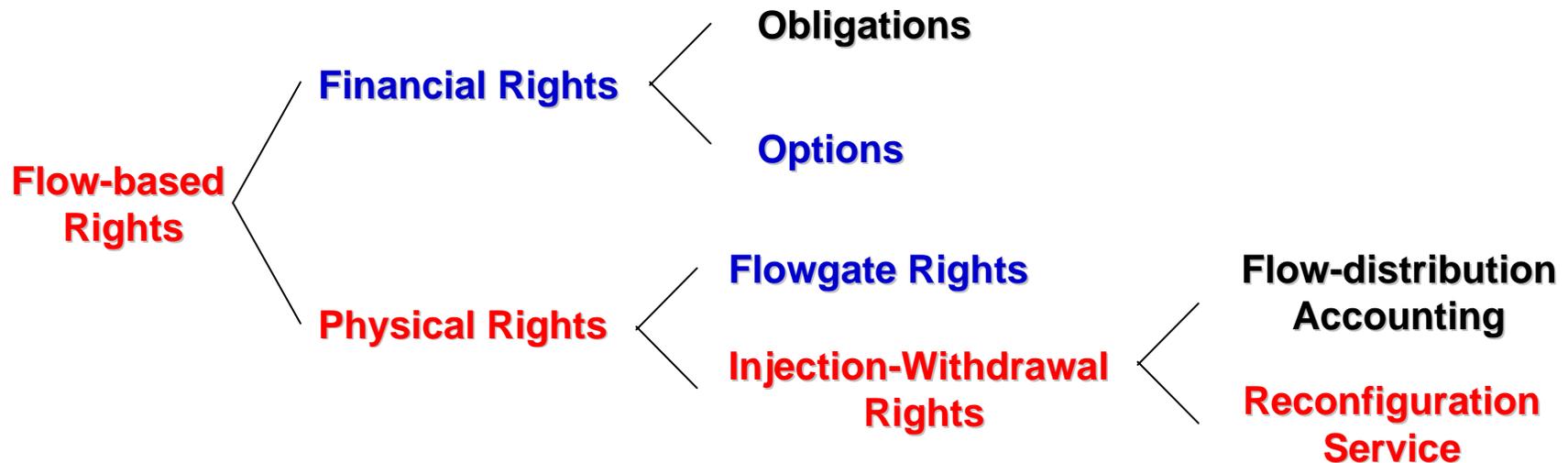


The Primary Flow-based Methods

- **Financial transmission rights approach:**
 - ✓ Accept all requests for usage (schedules) and manage congestion by centralizing unit commitment and system dispatch.
 - ✓ Make explicit congestion cost charges to all users.
 - ✓ In lieu of traditional “rights to schedule”, issue financial transmission rights, that refund excess congestion cost collection as a hedge exposure against a user’s congestion cost charges.
 - ✓ Creates a substantial transition issue for pre-existing rights.
- **Flow-based physical rights approach:**
 - ✓ Issuance of “rights to schedule” are used to manage congestion by *a priori* limitation of system usage, i.e., don’t accept all schedules.
 - ✓ Congestion cost is indirect, i.e., users must use higher cost resources than they would have had transmission rights been available to enable a lower cost dispatch.
 - ✓ Create a potential for under-utilization of the network if rights are static, i.e., if there is no mechanism to adjust usage as conditions change.



Flow-based Method Selection for Grid West



- IndeGO pursued a financial option right model from 1996 to 1998.
- RTO West began with a physical flowgate rights model from 2000 to 2001; the complexities of right conversions made the model unworkable.
- RTO West moved to a financial option right model for its Stage 2 filing in 2002; by mid-2003 it was clear that conversion problems and stakeholder resistance made implementation unlikely.
- Grid West adopted a physical injection-withdrawal rights model that did not require conversion and provided a reconfiguration service.



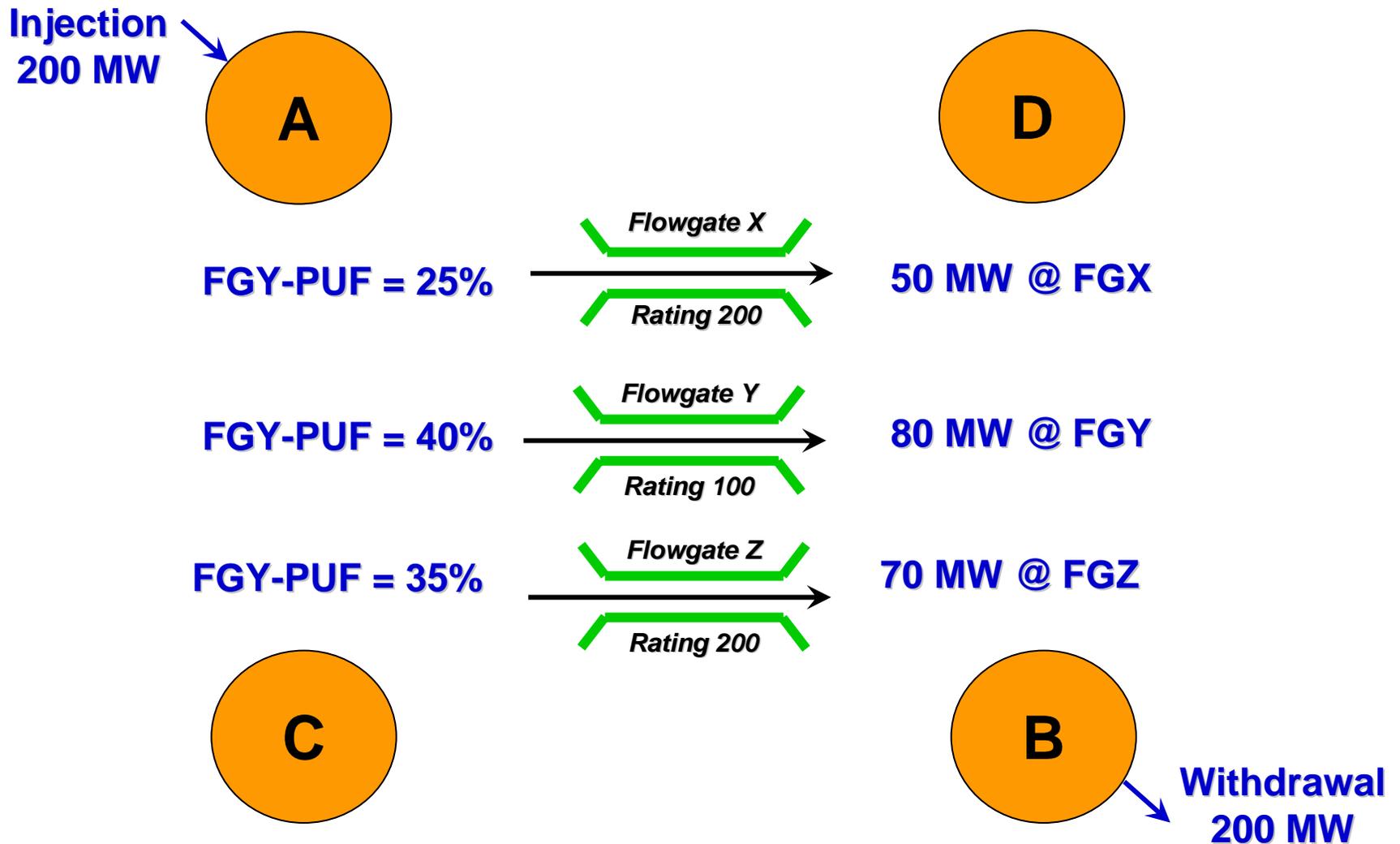
Flowgate Rights Method

- Identify critical flow gates for monitoring, usually connections between zones that are most likely to be constrained.
- Evaluate the impact of a request on each flow-gate.
- Rights to use a given flowgate are issued based on available flow capacity on the impacted flowgates.
- Holders of individual flowgate rights are allowed to trade rights without third-party intervention.
- Users must purchase a portfolio of flowgate rights before submitting schedules.



Flow Gate Rights Example

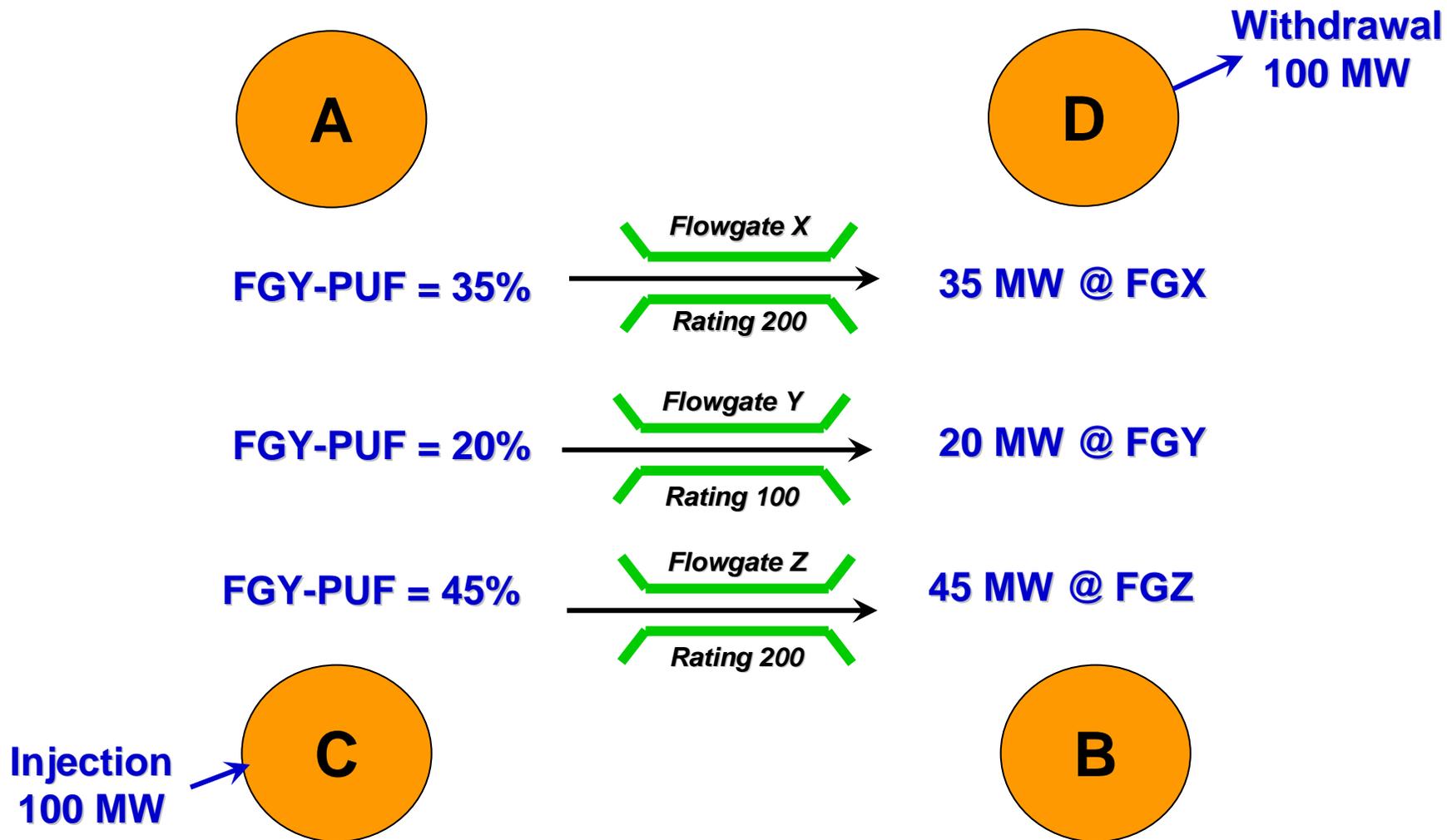
200 MW A → B





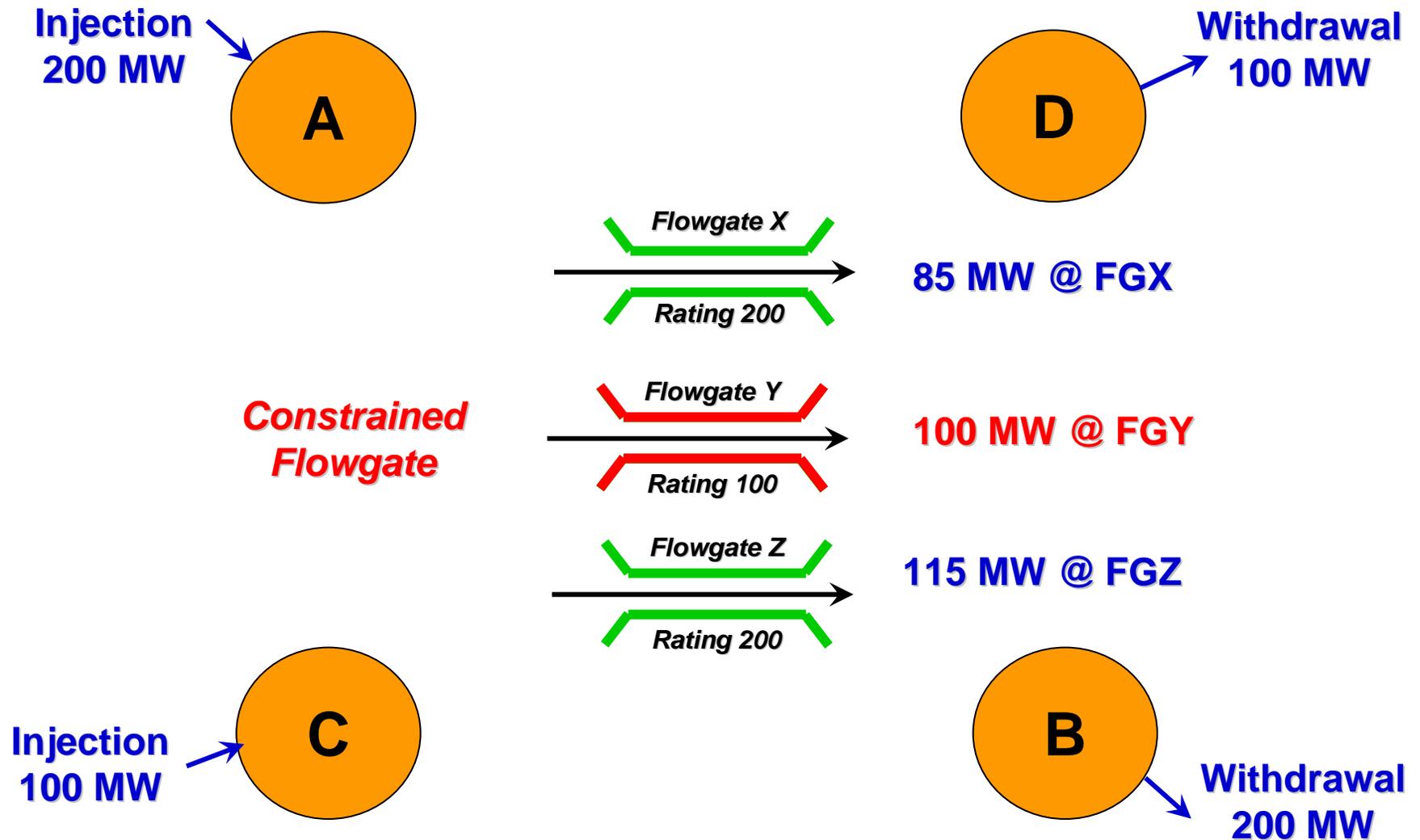
Flow Gate Rights Example

100 MW C→D





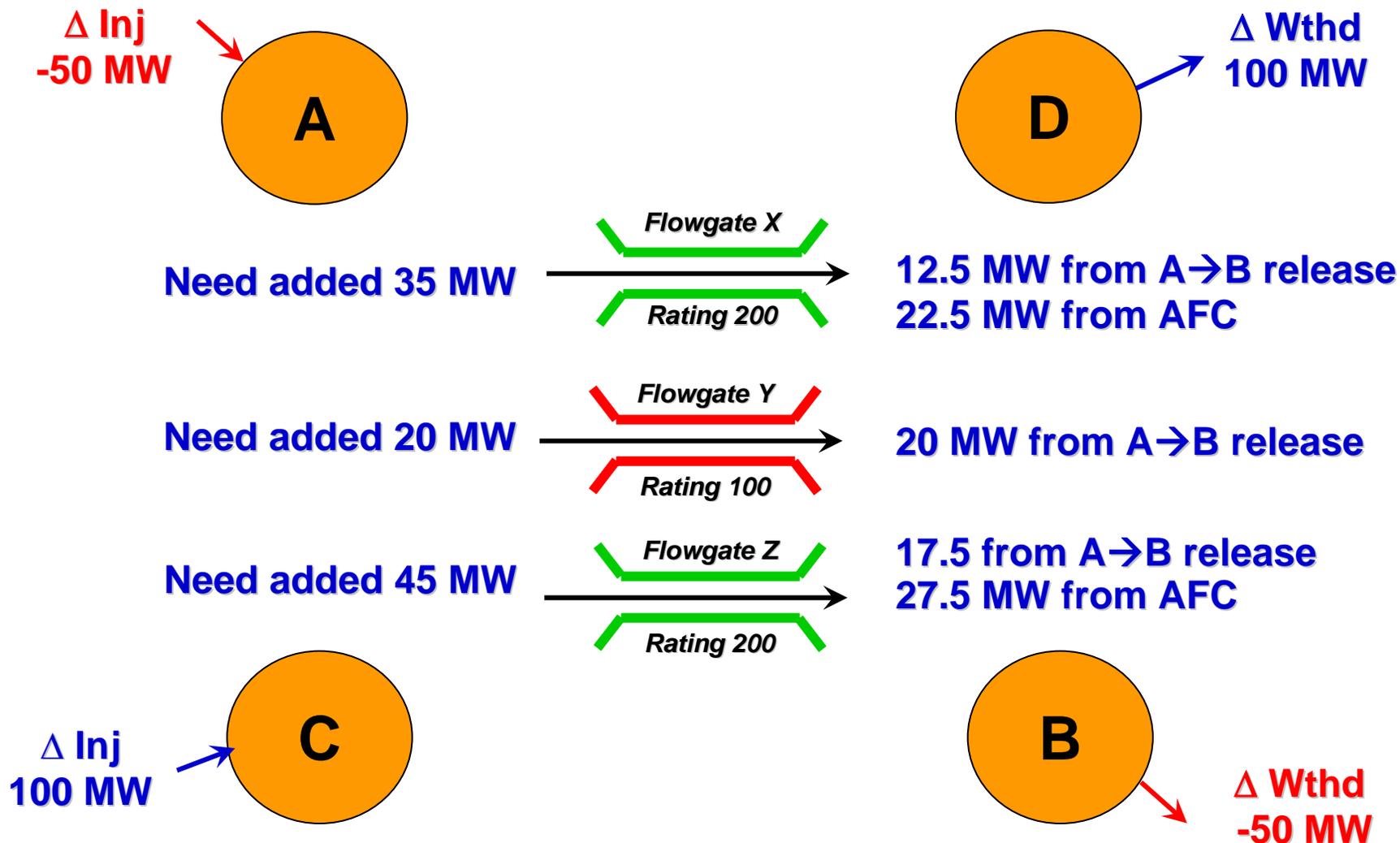
Flow Gate Rights Example Combined Effect





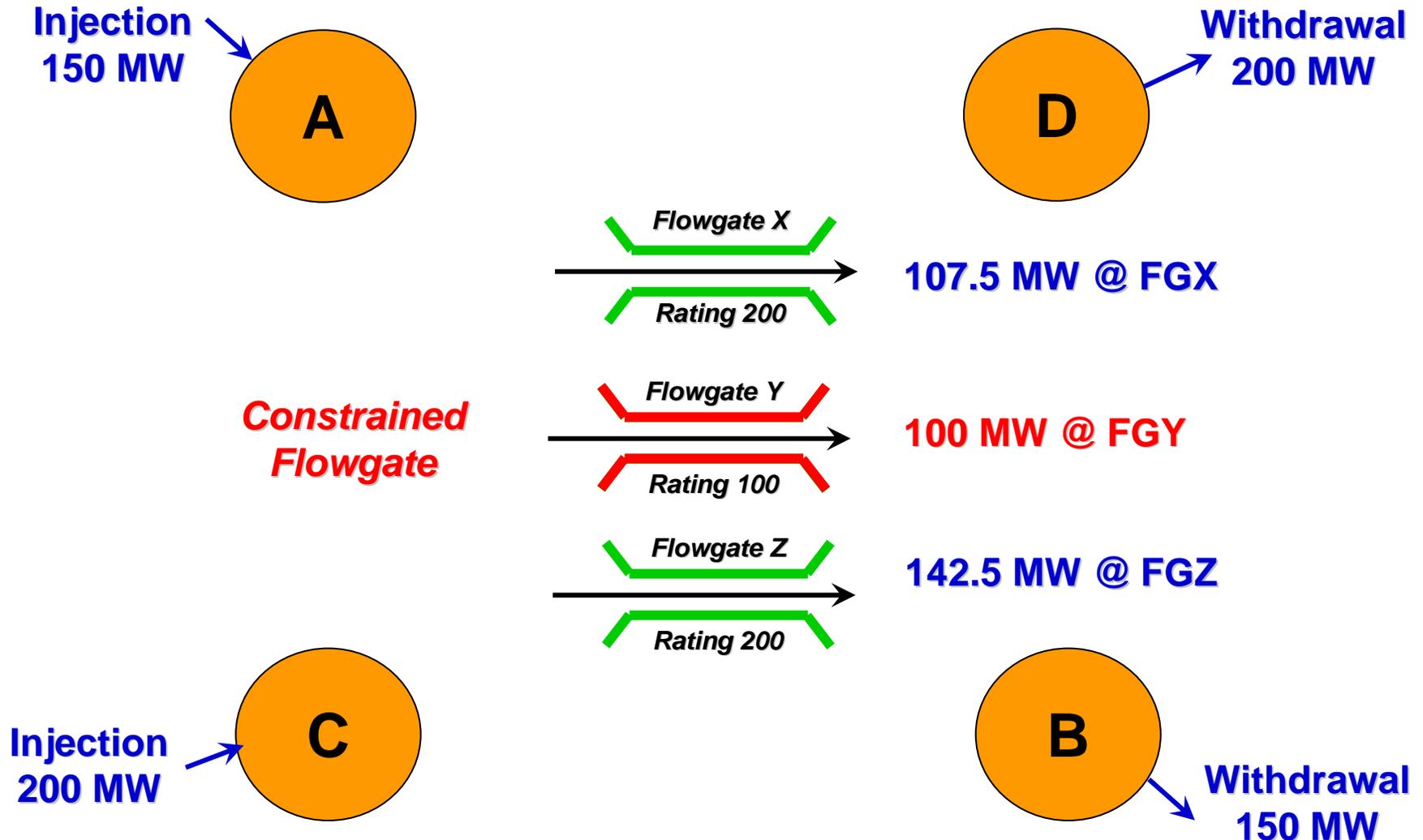
Flow Gate Rights Example

Request for Added 100 MW C→D





Flow Gate Rights Example Combined Effect after Trade





Flowgate Right Evaluation

- **Advantages:**

- ✓ Enables direct trading of capacity between users.

- **Disadvantages:**

- ✓ Transaction burden is very high for users.

- Their portfolio of rights must be adjusted on all flow-gates whenever the user wants to change their resource use (buys and sells).

- ✓ Conversion of pre-existing rights is a nightmare.

- Native load use must be included, but today that use is netted within control areas.
- When existing use is converted to flowgate rights, the result is a huge over claim upon the system because diversity is ignored.

- ✓ Not particularly flexibility to system changes.

- Whenever new facilities are added, flow impacts change and rights must be restated.
- Are outages considered?
- Are their de-minimus impacts?

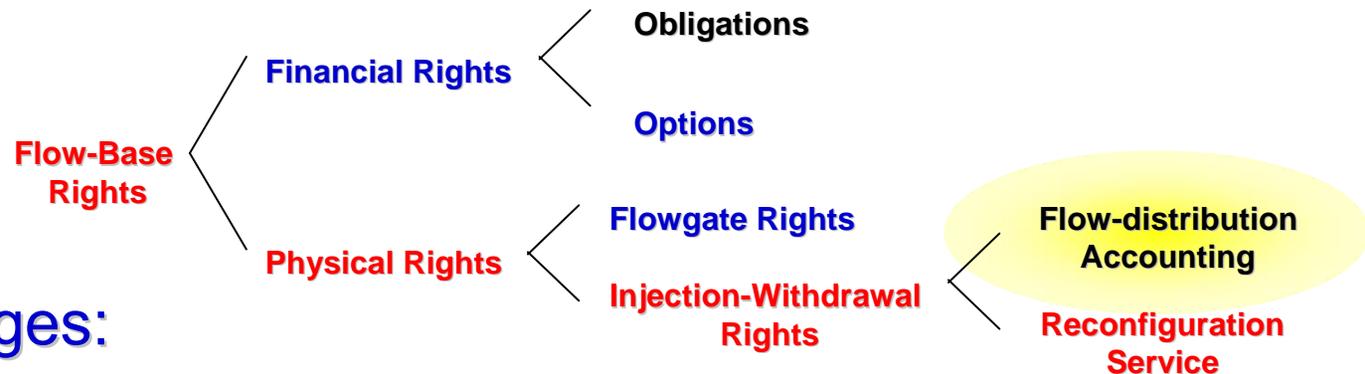


Injection-Withdrawal Methods

- An injection-withdrawal right (IWR) allows the holder to submit a schedule to inject energy at a given point and make a simultaneous withdrawal at another point.
- A central administrator deals with issuing new rights:
 - ✓ An inventory of existing rights is maintained.
 - ✓ Conversion of pre-existing rights not needed.
 - ✓ The degree of netting to be recognized, outage considerations, etc. are the responsibility of the administrator.
- Rights are issued based on available flow capacity on all impacted facilities (individual elements, rated-paths, flowgates, etc.)
- Trading of rights can only occur on a one-to-one basis unless the administrator is involved.
- Two alternatives:
 - ✓ Flow-distribution accounting
 - ✓ Reconfiguration Service



Flow-distribution Accounting



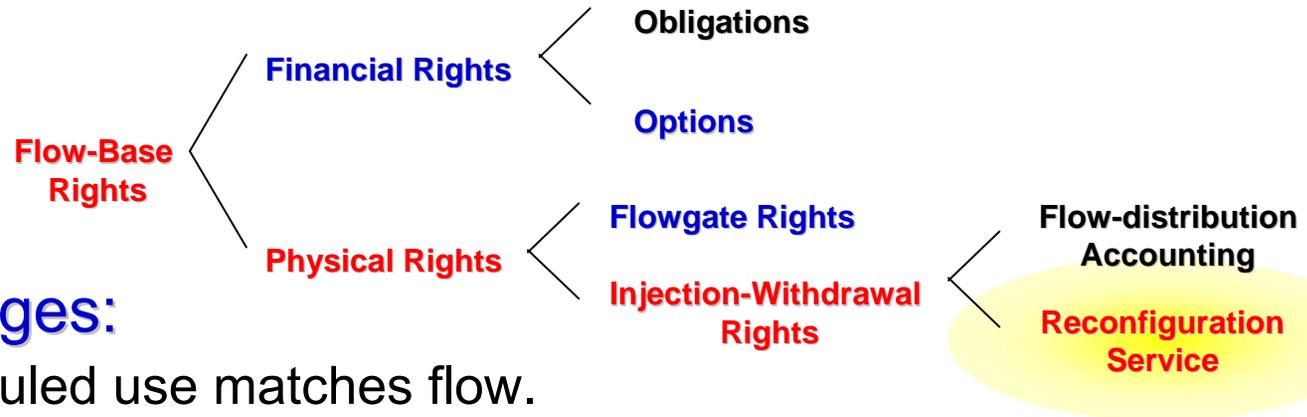
■ Advantages:

- ✓ Scheduled use matches flow.
- ✓ Simple, usable product for users.
- ✓ Impact components can be assigned by facility ownership.

■ Disadvantages:

- ✓ Changes in system topology require recalculation of all components, including, assignment of impact to owners.
- ✓ Does not address the need to trading of transmission rights among right holders to make full use of available capacity.
- ✓ Does not produce congestion-price signals to users, i.e., the market based value of transmission capacity to users.

Reconfiguration Service



■ Advantages:

- ✓ Scheduled use matches flow.
- ✓ Simple, usable product for users.
- ✓ Enables trading of transmission of rights in an open, transparent market that produces price-based congestion management signals.
- ✓ Changes in system topology are inherently included in each successive auction by the simultaneous nature of auctions.

■ Disadvantages:

- ✓ Rights are drawn from the combined, single-system without regard to ownership.

Simple Example of Reconfiguration Service

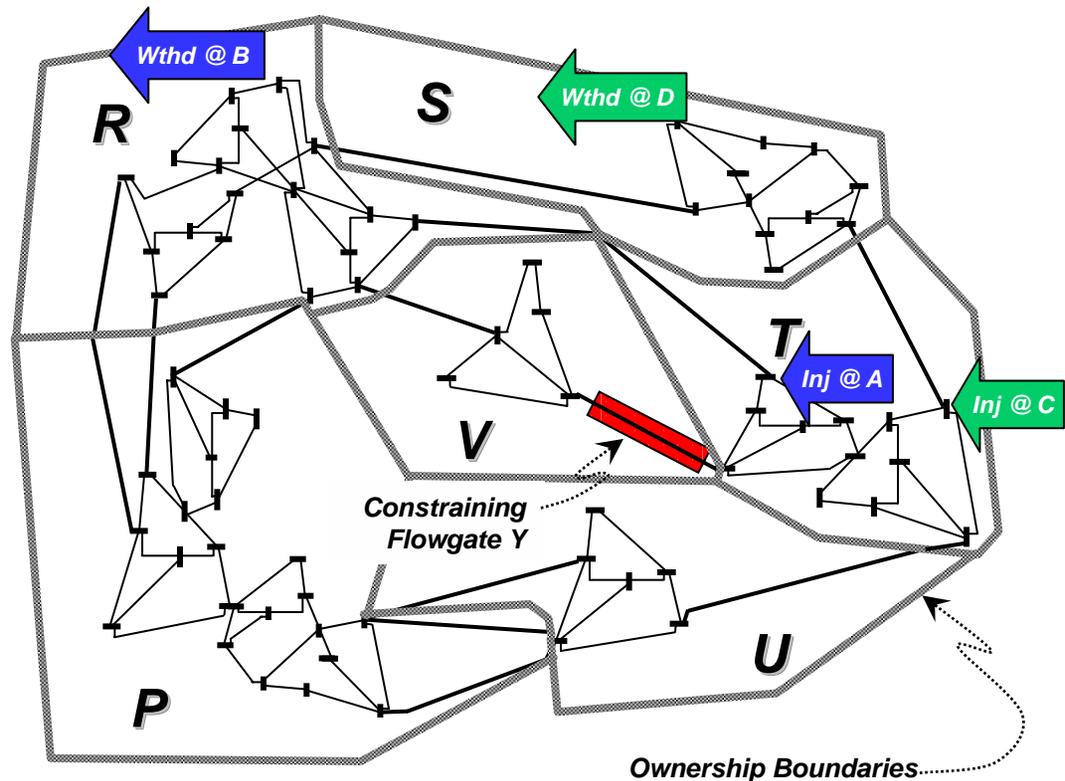
Auction Inputs:

- ✓ Holder of A→B offers to release up to 100 MW at \$4/MW or more.
- ✓ Holder of C→D request added 100 MW at \$3/MW or less (\$300).

Auction Outcome:

- ✓ Constraining Flowgate Y is in System V.
- ✓ 50 MW of A→B used to issue 100 MW C→D at \$3/MW (\$300 collected).
- ✓ A→B paid \$300 (\$6/MW) and keeps 50MW A→B.
- ✓ Published prices allow all users to see the value of their rights (an open, transparent market that encourages trade in subsequent auctions.)

- **Note:** All trades made are simultaneously, so in actual practice tracing who sold what to whom is not possible.



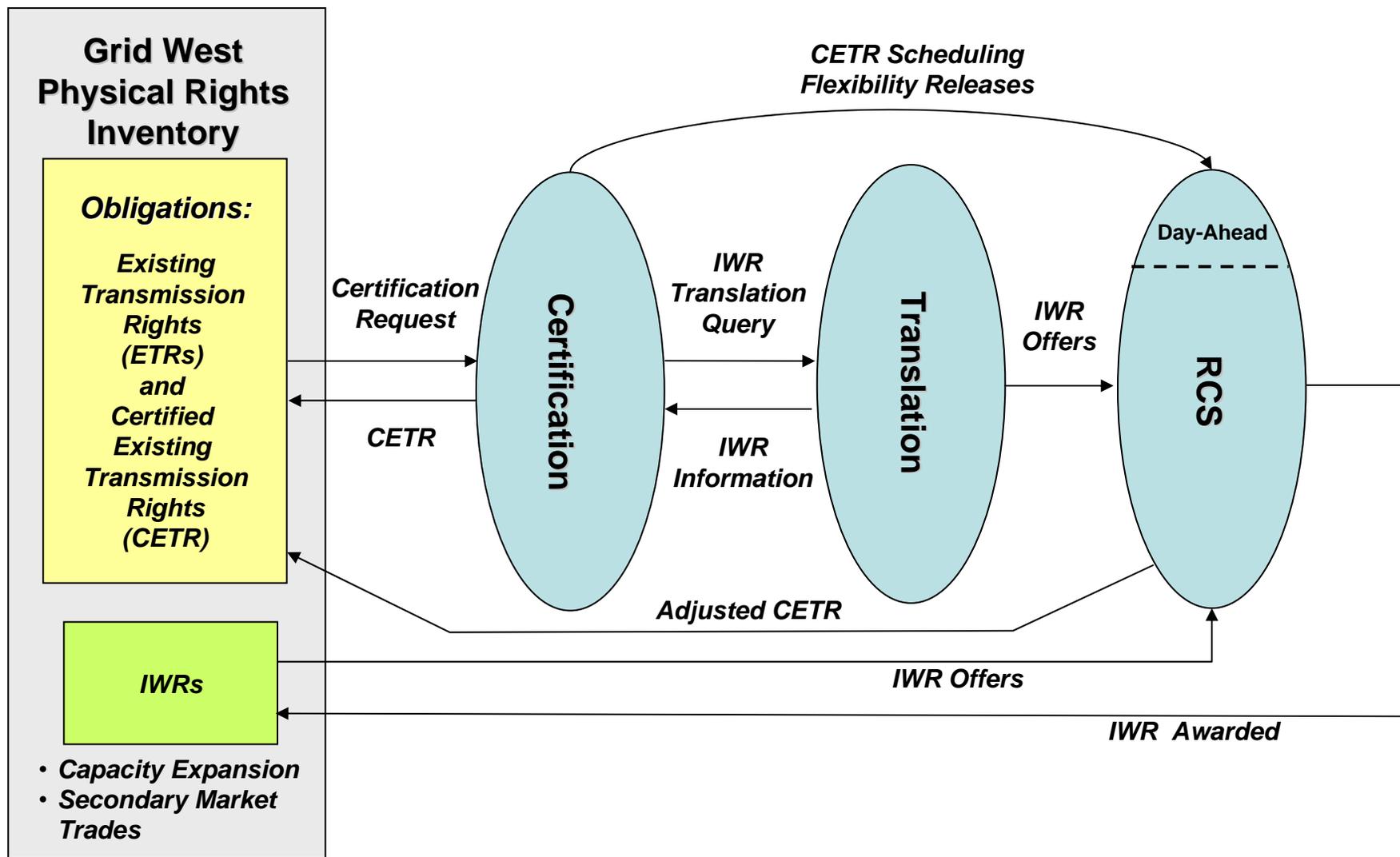


Addressing Scheduling Flexibility of Existing Rights

- Many existing contracts between transmission owners and users allow the use of alternative points of injection to serve a given load:
 - ✓ Capacity must be retained to honor the existing scheduling flexibility.
 - ✓ The user's optionality has value, both to the user (flexibility for dispatch adjustments) and to other system users (releasing flexibility can allow more IWRs to be issued and capacity better utilized.)
- A financial rights implementation can address the problem through commitments made in a day-ahead energy market:
 - ✓ However, because Grid West markets will be voluntary, a day-ahead redispatch-market would be only partial.
 - ✓ A partial day-ahead market won't work, because any day-ahead optimization could be undone by later schedule changes under retained pre-existing rights.
- For Grid West, the solution was to make allow users to offers up their scheduling flexibility in the Day-ahead Reconfiguration Auction.



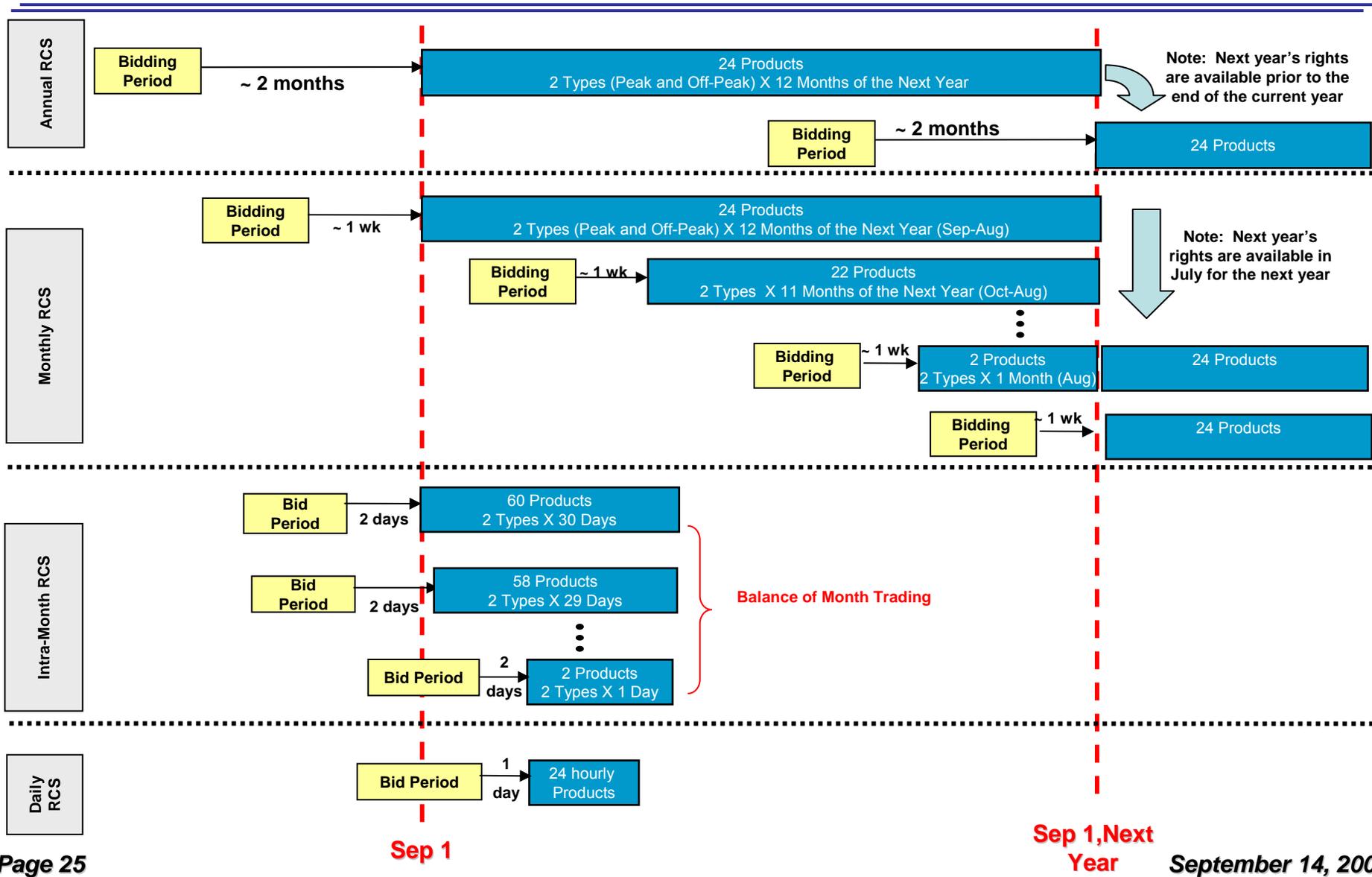
Rights Data Management





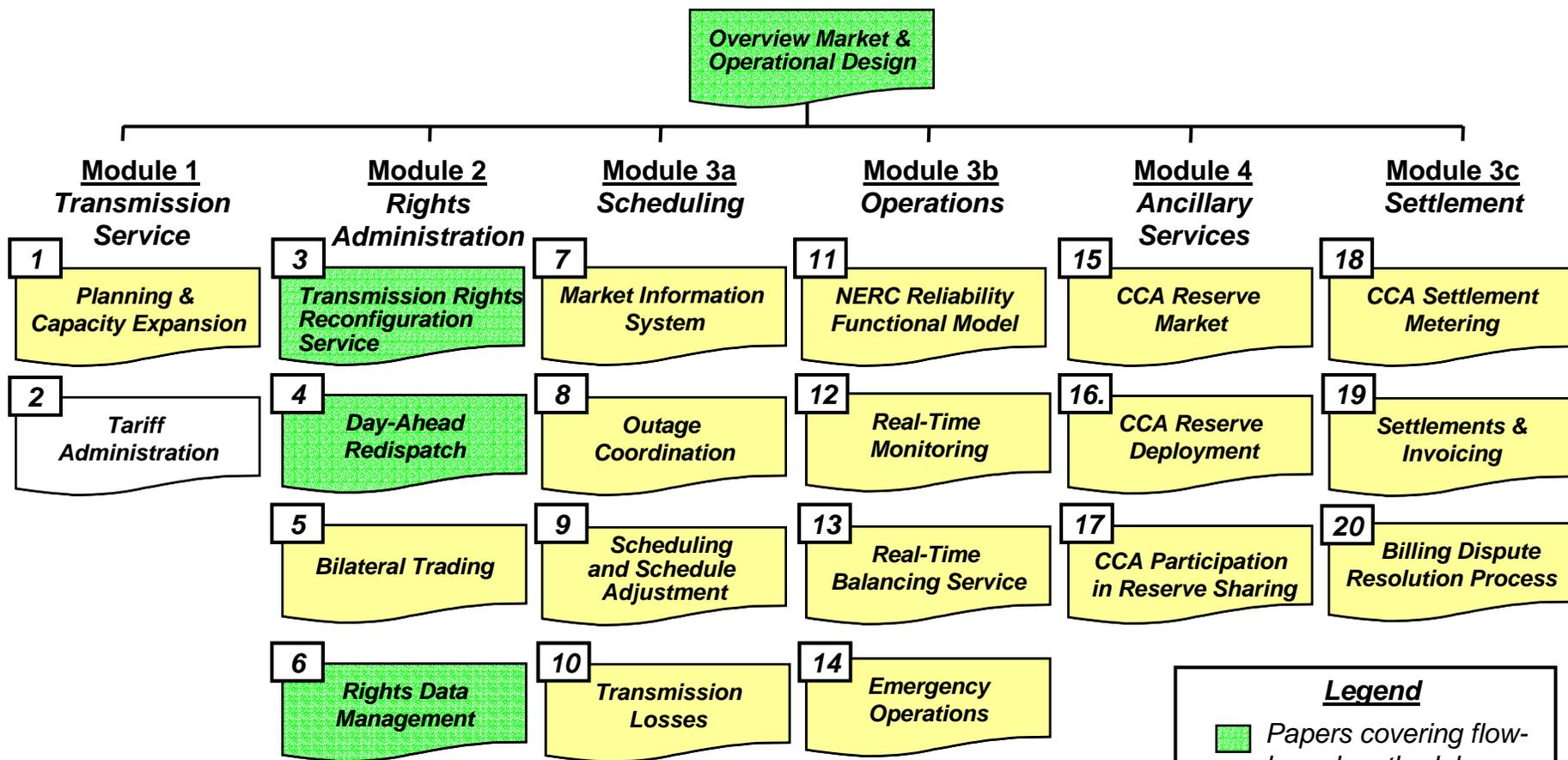
Feature Details

Auction Timeline and Products



TSLG White Papers

(See: www.gridwest.org/DP2Info.htm)



Reference Papers

