A Congestion management regime (without allocating “rights”)

March 2008

Current situation

- The current market has been adversely affected by congestion
- This is due to the simple settlement process, which is distorting incentives in the presence of congestion
- This distortion is expected to worsen with the rapid introduction of significant intermittent generation

Aim of Proposal

- Retain regional market design –
  - Totally in the absence of congestion, and
  - As far as compatible with efficient dispatch otherwise
- In the case of congestion, replace the existing right to settlement at the Regional Reference Node price – with an alternative form of right that eliminates the distorted incentives
- Eliminate the need for market interventions (such as clamping) while supporting inter-regional trade

Current outcomes of congestion

- Incentive for “disorderly bidding”
  - High risks for those who don’t
- Inefficient dispatch
  - High fuel cost displaces low fuel cost
- Reduced & counter-price interconnector flow affecting settlement residues
  - Undermines inter-regional hedging
- Clamping
  - Compounds inefficient dispatch

This Scheme

- Allows the current dispatch process to work with efficient bidding incentives
  - Only adjustments are in settlements
- No prior allocation of rights
  - Adjustment based on presented capacity
- Interconnectors and generators treated equally
  - Restores inter-regional hedging capacity
  - No flow clamping required

What's wrong with CSP/CSC?

- CSP's alone destroyed an existing right:
  - Settlement at RRN price for actual production
- CSC's could broadly restore this right
  - But the required explicit ex-ante allocation or auction is impractical
- We propose instead an automatic dynamic allocation
  - No ex-ante decisions needed, and best replicates current right

This scheme is aimed at operational efficiency only

- The scheme does not distinguish between old and new players
  - New generators can locate in congested areas and receive an equal share of congestion to incumbents
- Therefore this scheme does ***not*** address investment locational signals, nor the level of congestion
  - But addresses the symptoms of congestion

The proposal

- The proposal resembles CSP/CSC, except that–
- It applies universally to all binding constraints that have generator terms*
- the equivalent of contract quantity is –
  - Determined real-time
  - A share of the capability of the constraint
    - Settlement adjustments sum to zero
  - Shared pro-rata on presented capacity
    - For generators on the basis of bids
    - For interconnectors on the basis of other limits

* See more detailed discussion later for alternatives

The proposal (cont.)

- Includes the existing Regional settlement as a first step, and
- Adds two further steps, IFF there is a binding constraint with generator term(s)*, with these steps repeated for each such constraint

* See more detailed discussion later for alternatives

STEP 2

- Identical to CRA's CSP i.e.
- Adjustment = Energy * Contribution Coefficient * price of constraint

  Energy: relevant unit production in the period

  Contribution coefficient: from constraint equation

  Price of constraint: marginal value in dispatch (at the time)

  - In effect, this brings the total settlement (so far) to the local price
    - Removes "disorderly bidding" incentive

STEP 3

- Equivalent to CSC, contract quantity replaced by a dynamically determined quantity “RRNshare”
- Adjustment = RRNshare * Contribution Coefficient * price of constraint
- Where: $$\mathbf{RRNshare_i} = \mathbf{RHS} * \frac{\mathbf{Availability_i}}{\sum_{\text{units in constraint}} (\mathbf{Availability} * \mathbf{Contribution\ Coefficient})}$$

Where: RHS = Right Hand Side of constraint (= $\sum_{\text{units in constraint}}$ (gen * Coefficient); including interconnectors)

  - In effect, brings total settlement to a point such that all players receive a pro-rata “right” to RRN settlement, plus variations at the local price

Illustration for case of local price < RRN price

Step 1: Normal regional settlement

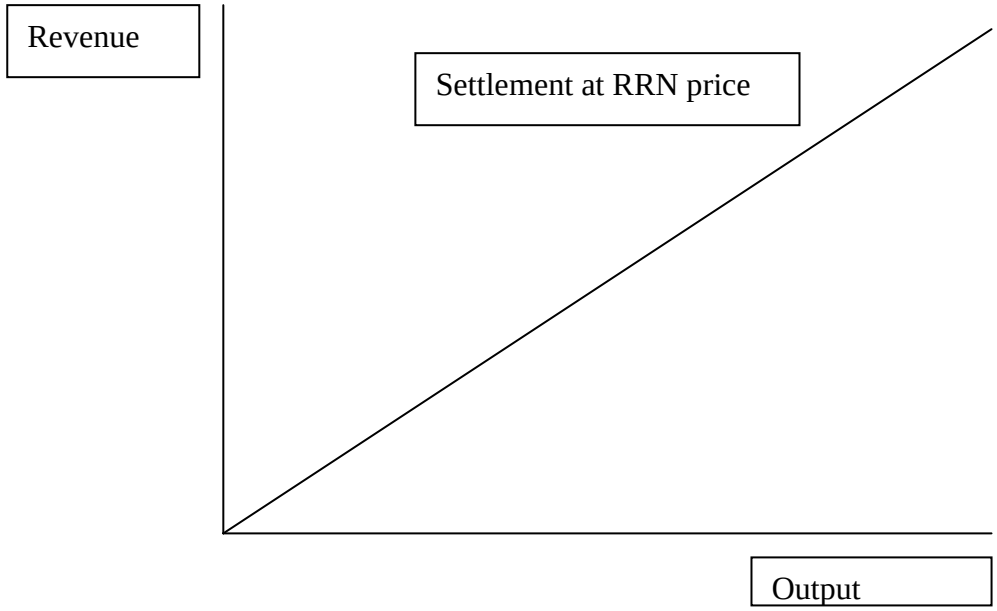
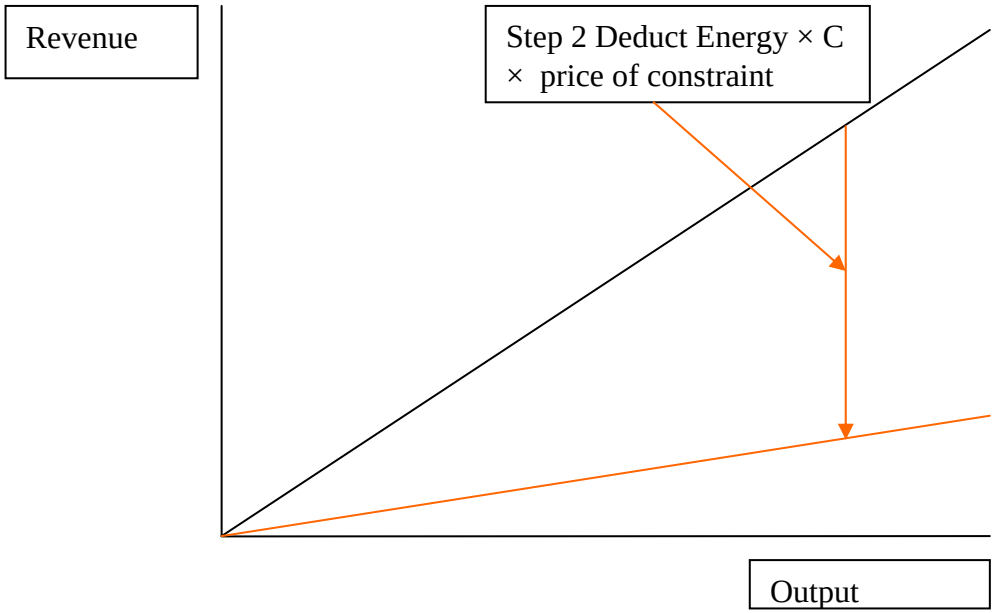


Illustration for case of local price < RRN price

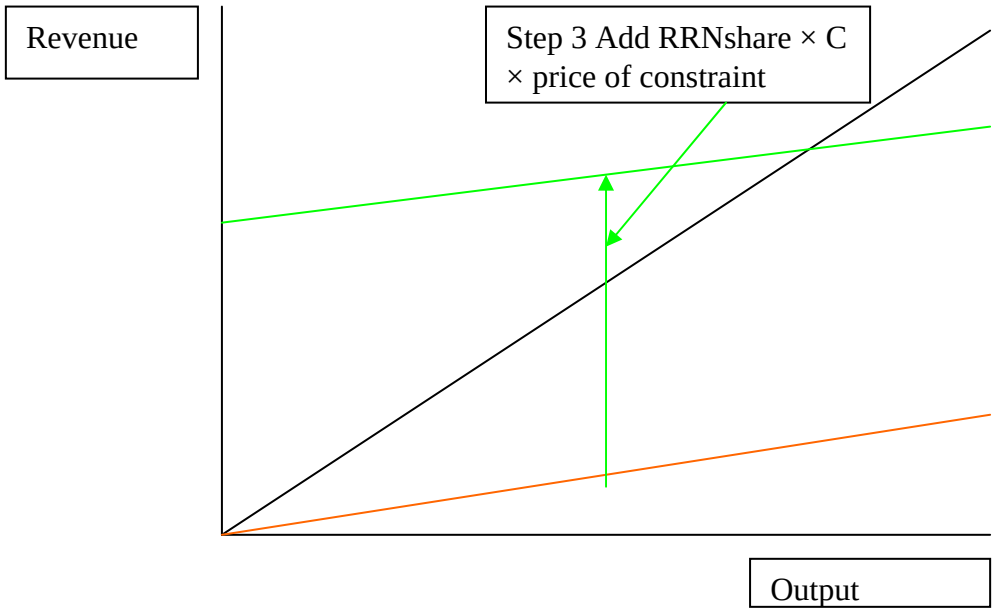
Step 2:



Result (red line) is a net revenue at the generator's local price (as an intermediate result)

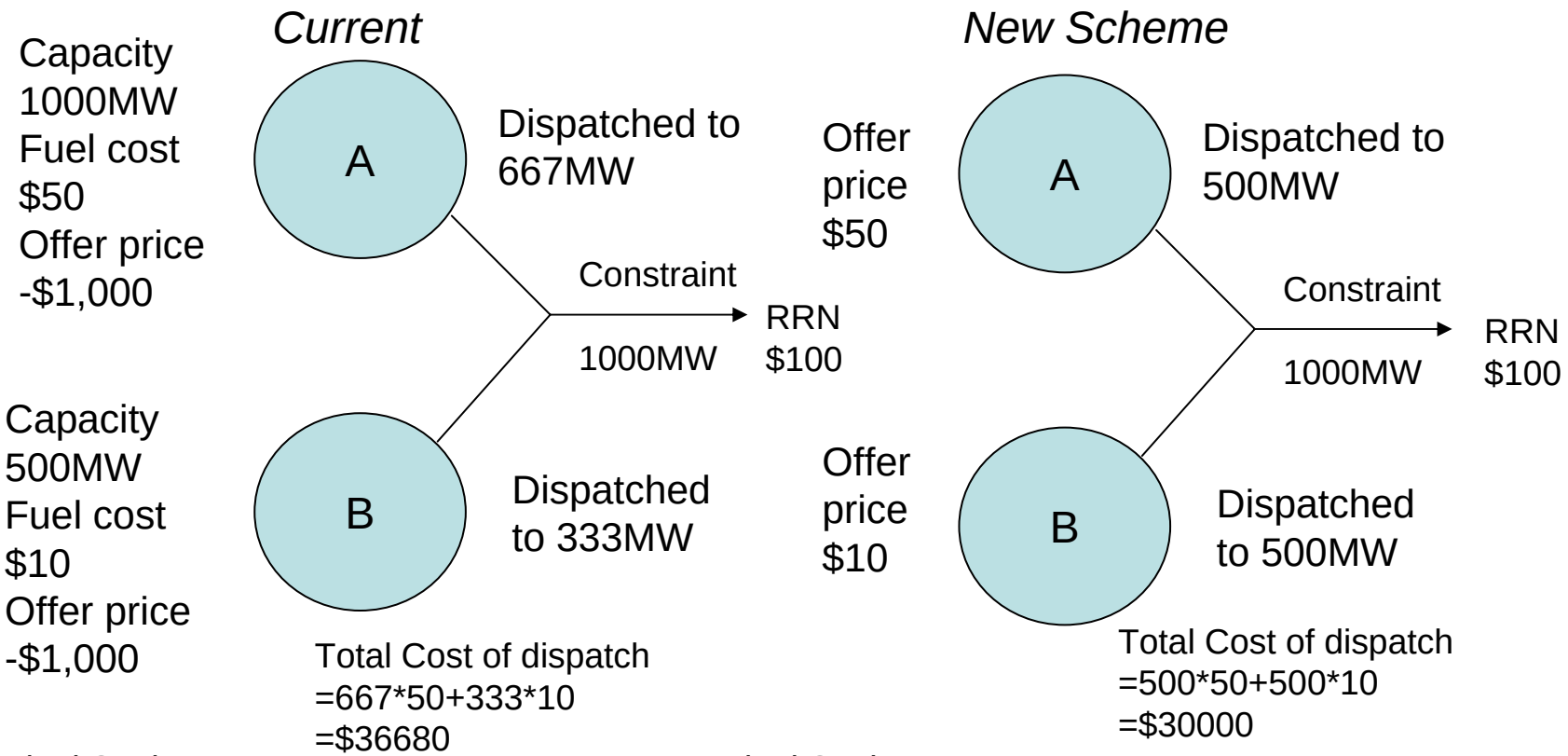
Illustration for case of local price < RRN price

Step 3: Green line shows net result of the 3 steps



Incentive: maximise gen if marginal cost is below local price, minimise it if marginal cost is above local price: maximise availability either way.

Congestion Management example



Final Settlement:
A=667*$100=$66700
B=333*$100=$33300
Profit net of fuel:
A=$66700-667*$50=$33350
B=$33300-333*$10=$30000

Final Settlement:
A=500*$100-(500*$50)+1000*1000/1500*50=$58333
B=500*$100-(500*$50)+1000*500/1500*50=$41666
Profit net of fuel:
A=$58333-500*$50=$33333
B=$33333-500*$10=$36667

Illustration for case of local price > RRN price

Step 1; Normal regional settlement

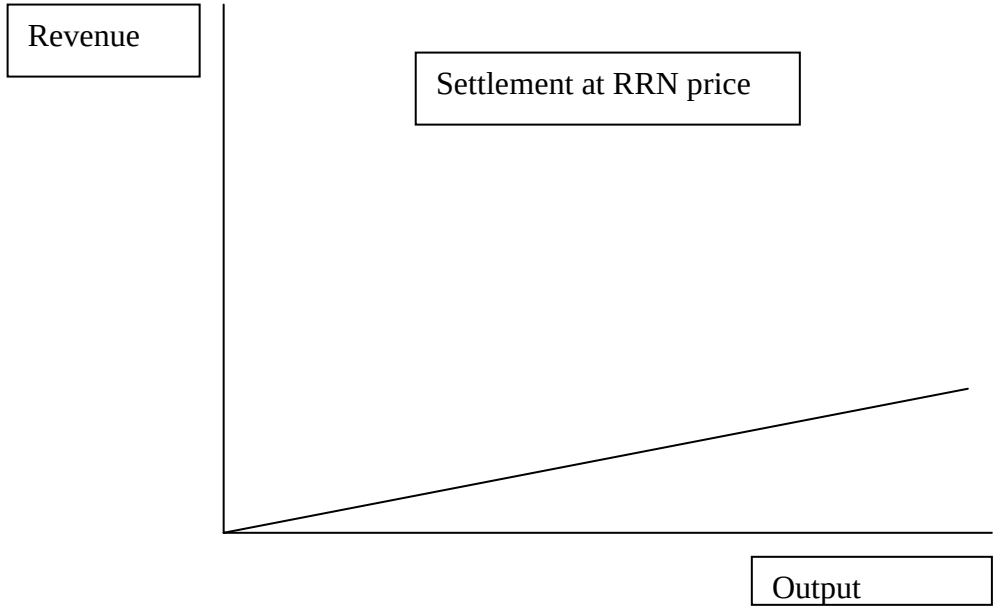


Illustration for case of local price > RRN price

Step 2:

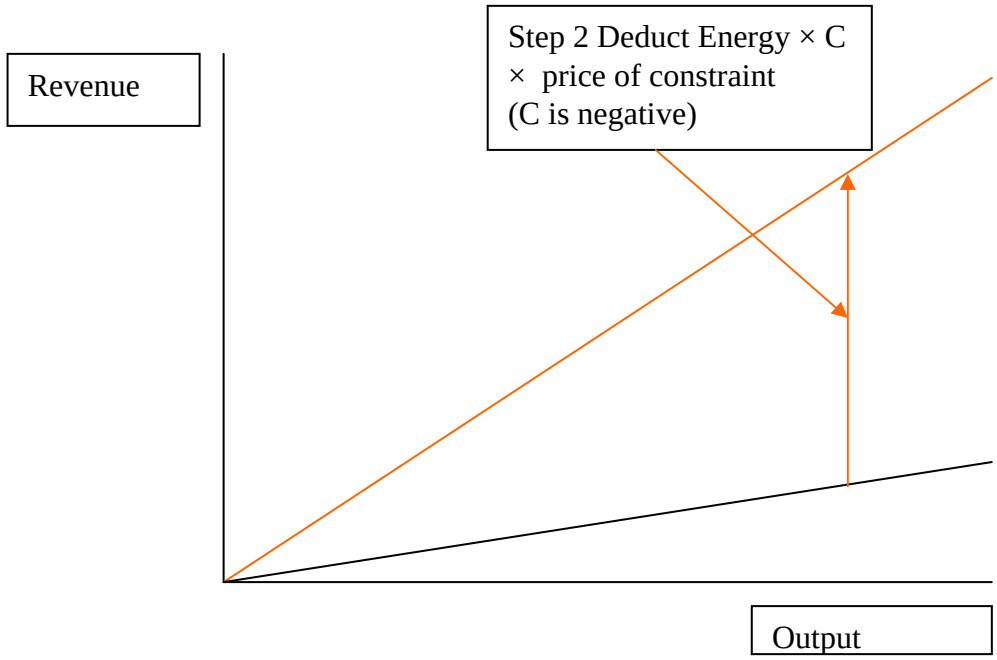
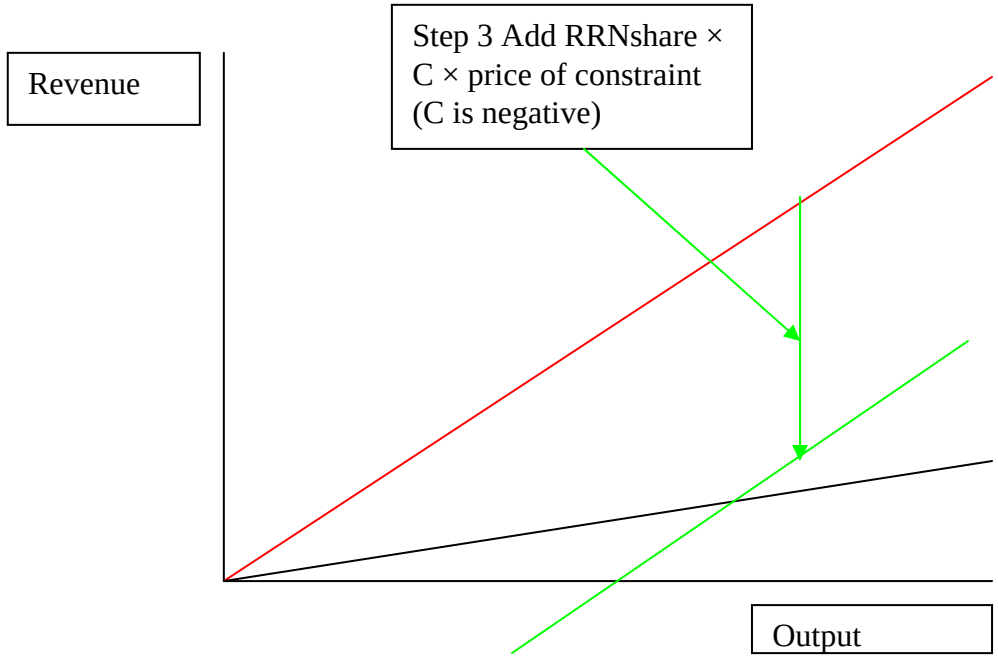


Illustration for case of local price > RRN price

Step 3: Green line shows net result of the 3 steps



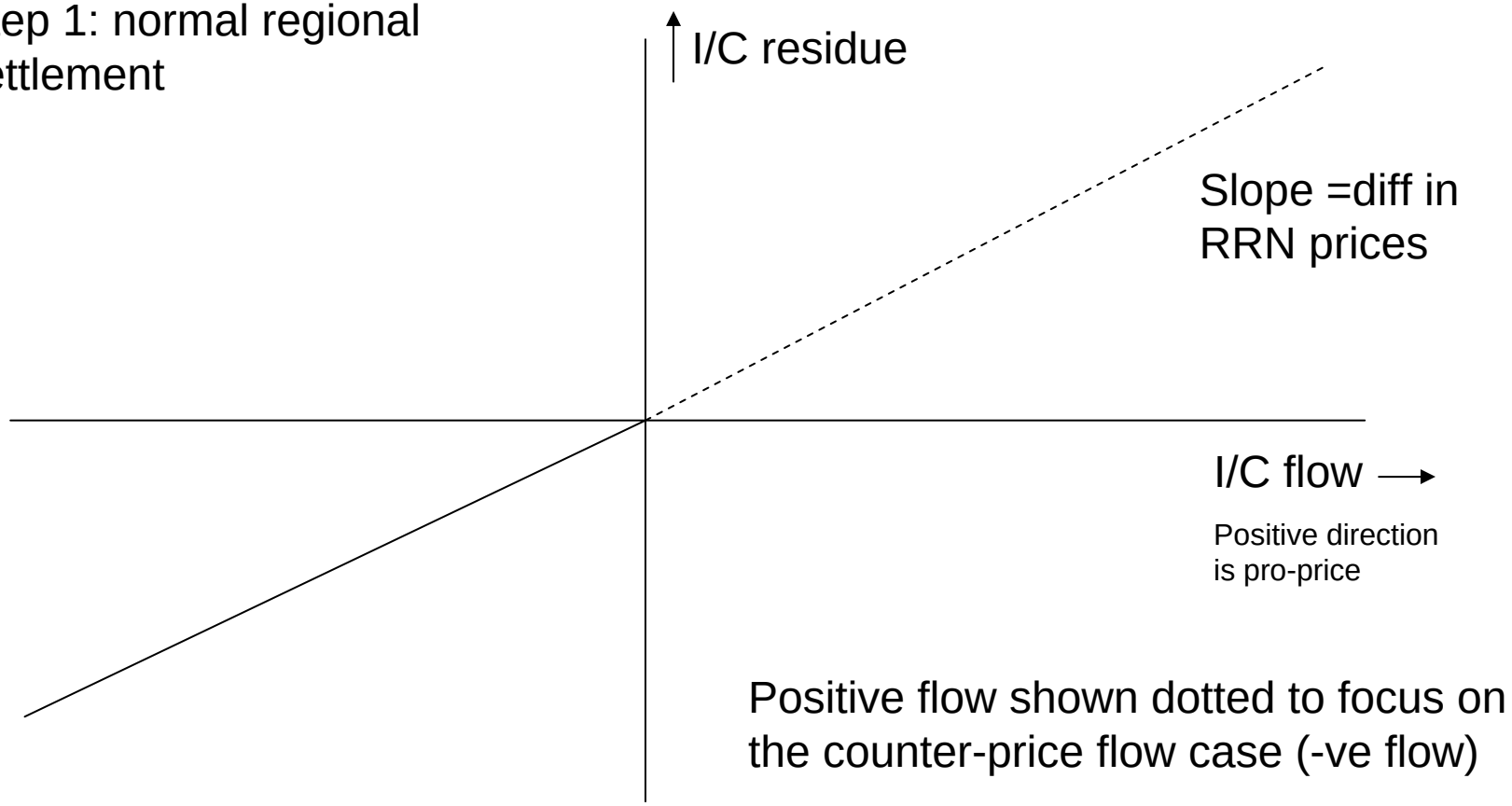
Incentive: Maximise generation if marginal cost less than local price (while available); BUT eliminate availability unless net revenue exceeds marginal cost of generation

Note: existing incentive to eliminate availability when constrained-on will still apply in most cases

Illustration of I/C residue

Consider the case where counter-price I/C flow is dispatched under this proposal

Step 1: normal regional settlement



Positive flow shown dotted to focus on the counter-price flow case (-ve flow)

Illustration of I/C residue

Consider the case where counter-price I/C flow is dispatched under this proposal

Step 2; deduct flow*c*value of constraint

Note: Value of constraint must exceed diff in RRN prices for counter-price flow to be dispatched

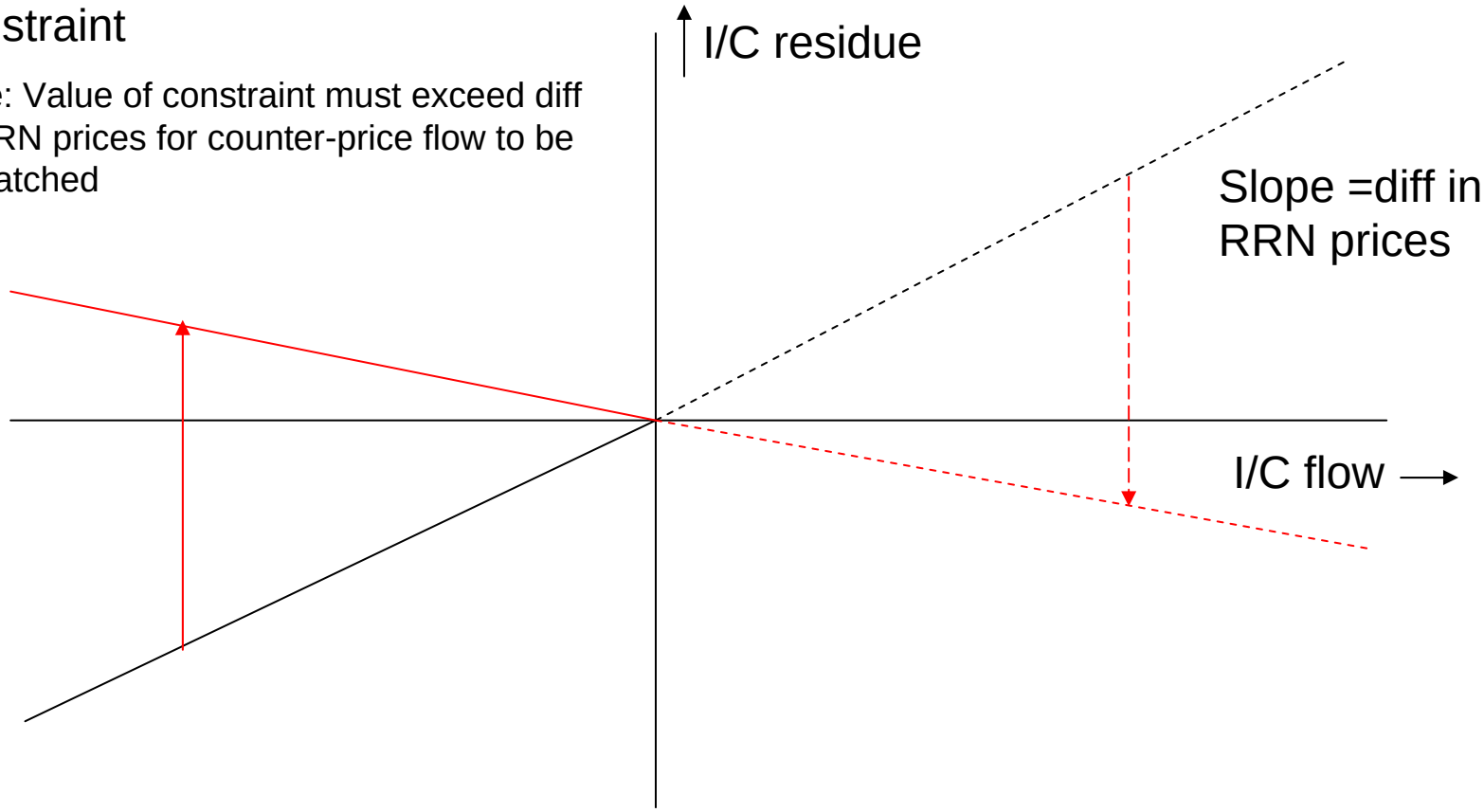
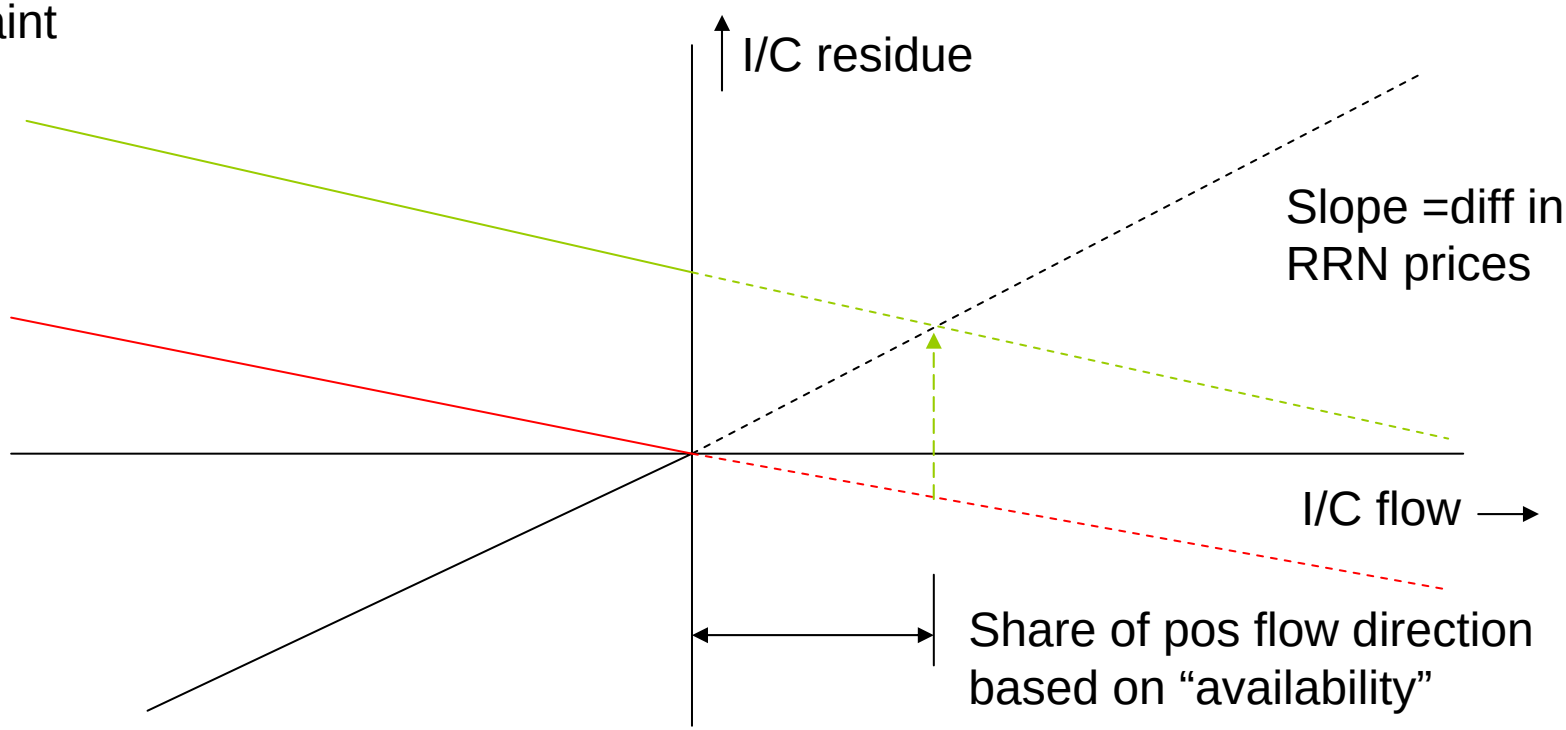


Illustration of I/C residue

Consider the case where counter-price I/C flow is dispatched under this proposal

Step 3: Add RRNshare * c * price of constraint



I/C residue: For counter-price flow, the residue exceeds that for the allocated quantity in the pro-price direction; residue increases with counter-price flow at a rate equal to –

{receiving region price less local price} i.e the value of this flow in dispatch

Benefits

- Eliminates the incentives for “disorderly bidding”
- Allows efficient operation of a regional market
- Low implementation cost; requires only the development of an additional settlement process
- Funds counter-price interconnector flow residue, eliminating the need for clamping
- Does not deprive participants of an existing right without compensation

Benefits (cont.)

- No auction or ex-ante allocation of contracts
- Does not give priority in dispatch to any participant or group of participants
- No incentive to distort unit dispatch targets
  - E.g. ramp rates, inflexibility, FCAS trapezium
- More predictability in RRN access
  - Better for hedging, locally and inter-regionally
- Assists AER measurement of congestion
  - True constraint price revealed

Design issues in detail

- Time interval for settlement process
- Derivation of relevant energy quantities,
- Definition of availability for interconnectors,
- Pure Constrained-on case,
- Mixed constraints

Time interval for settlement process

- The processes are purely “mechanical” and are based on dispatch data,
- Convenient to operate on a dispatch interval basis
- This is consistent with the existing settlement of the market ancillary services
- The existing 5/30 settlement anomaly remains but is not made worse by this proposal

Energy quantities

- Spot prices are calculated as a price at generator terminals, but are settled to the sent-out (after internal use is deducted)
- This existing anomaly in settlement remains in this proposal, but is not made worse
- Steps 2 & 3 must both use either generated or sent-out energy

Energy quantities (Cont.)

- Proposed to use sent-out energy derived from –
  - Revenue metered sent out energy for TI, and
  - Generated energy for DI based on beginning and end generated values (as used in dispatch)
  - Relationship between generated and sent-out for each unit for each trading interval (using a summation of the generated values described above)
- Consequential minor change is required to the definition of RRNshare (to include relationship between generated and sent out energy)

Availability of an interconnector

- We need to define an availability
- For a generator, the availability defines the maximum use of the constrained link that the generator could make, if it out-competed its rivals
- Interconnectors are simultaneously subject to several constraints,
  - each representing a limit on a different network component.
- We use the most restrictive of the non-binding constraints,
  - defines the capability of the interconnector if it out-competed its rival generators and/or interconnectors
- NEMMCO already has a tool to evaluate this

Constrained-on generation

- Illustrations above showed this case, but noted that incentive to withdraw availability from dispatch will generally remain,
- Consider two distinct cases–
  - A constraint that solely constrains generation on,
  - A constraint that both constrains-on and constrains-off some generators and/or interconnectors

Pure constrained-on case

- Incentive to withdraw capacity remains,
- Resolution of this issue would require a compensation payment,
  - a financially-balanced process, such as this proposal, cannot supply this
- We propose detecting this case and simply omitting steps 2 & 3

Mixed case

- Exists where some generators can facilitate more network capacity for other generators or an interconnector,
  - "positive gatekeeper"
- We propose defining the settlement process to reward the positive gatekeeper, based on benefits conferred, and hence incentivise more efficient dispatch

Mixed case (Cont.)

- To incentivise more efficient dispatch –
  - The constrained-on units to have zero adjustment in Step 3, which leads to –
    - These units having net revenue at local price, and
    - The constrained-off units sharing the network capability that would have been available without the positive gatekeeper(s), not the larger capability enabled by that contribution
  - Note: the local price received by the positive gatekeeper is limited by the economic benefit in dispatch (otherwise not dispatched)

Questions?