CALIFORNIA ISO

MD02

Surrogate Aggregation Points: Example and Issues

CRR Stakeholder Meeting

April 13, 2004

CAISO Market Operations

Background

- In CRR Study 1, the CAISO used surrogate aggregation points to breakdown the large standard load aggregation points prior to the CRR Allocation
- This same process is being proposed in CRR Study 2

Background

- CRRs are balanced
  - Point to Point: Source MW = Sink MW
  - NSR: Σ (Source MW) = Σ (Sink MW)
- Standard Load Aggregation Points
  - Allocation Factors are fixed
- During the Simultaneous Feasibility Test (SFT) there may be large reductions in the CRR MW to alleviate a constraint violation

Background

- During the Simultaneous Feasibility Test (SFT) there may be large reductions in the CRR MW to alleviate a constraint violation
- The MW amount of reduction may be quite large relative to the amount that needs to be alleviated because the Allocation Factors are fixed
- Example given in CRR educational class, presentation #9

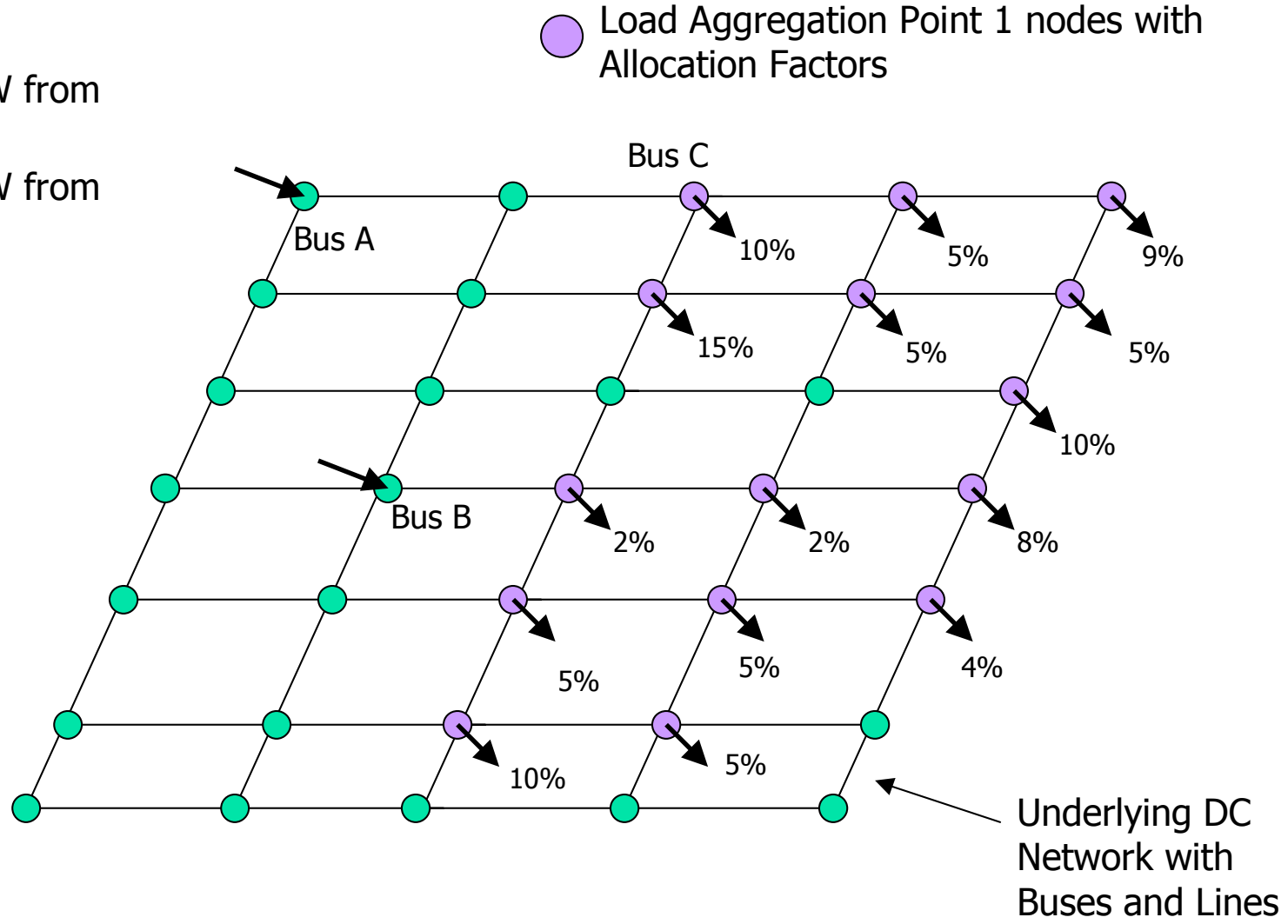
Example

- Two CRRs
- CRR1
  - 100 MW
  - Source = Bus A
  - Sink = Load Aggregation Point 1 (LAP1)
- CRR2
  - 100 MW
  - Source = Bus B
  - Sink = Load Aggregation Point 1
- Load Aggregation Point 1 is comprised of 15 buses

Network Model

CRR1: 100 MW from Bus A to LAP1

CRR2: 200 MW from Bus B to LAP1



Allocation Process Results

- By placing the CRRs on the network model assume there are 2 constraint overloads (not shown on diagram)
- Constraint 1 violated by 10 MW
- Constraint 2 violated by 20 MW
- Both CRR1 and CRR2 need to be reduced to alleviate constraint violations
- Minimize the MW of reduction
  - Since the Allocation Factors are fixed and the CRRs are balanced, **assume**
  - CRR1 is reduced by 60 MW
  - CRR2 is reduced by 90 MW

Surrogate Aggregations

- Break down the larger Standard Load Aggregation Points into smaller Load Aggregation Points
  - Smaller in terms of the number of nodes defined under the Load Aggregation Point
  - Intention is less overall CRR reduction to alleviate constraints
- The smaller Load Aggregation Points are called Surrogate Aggregation Points
- Developed by studying historical congestion patterns
  - Most congestion occurs on the inter-Surrogate interfaces
  - Nodal price clustering

Surrogate Aggregations

- Assume that Load Aggregation Point 1 is comprised of three Surrogate Aggregation Points (SAP)
  - SAP1
  - SAP2
  - SAP3
  - Surrogate Allocation Factors
  - Define the decomposition of the original Load Aggregation Point to the Surrogate Aggregation Points
    - Based on the Allocation Factors of the original Load Aggregation Point
    - Add up the LAP Allocation Factors per SAP

Network Model

CRR1: 100 MW from Bus A to LAP1

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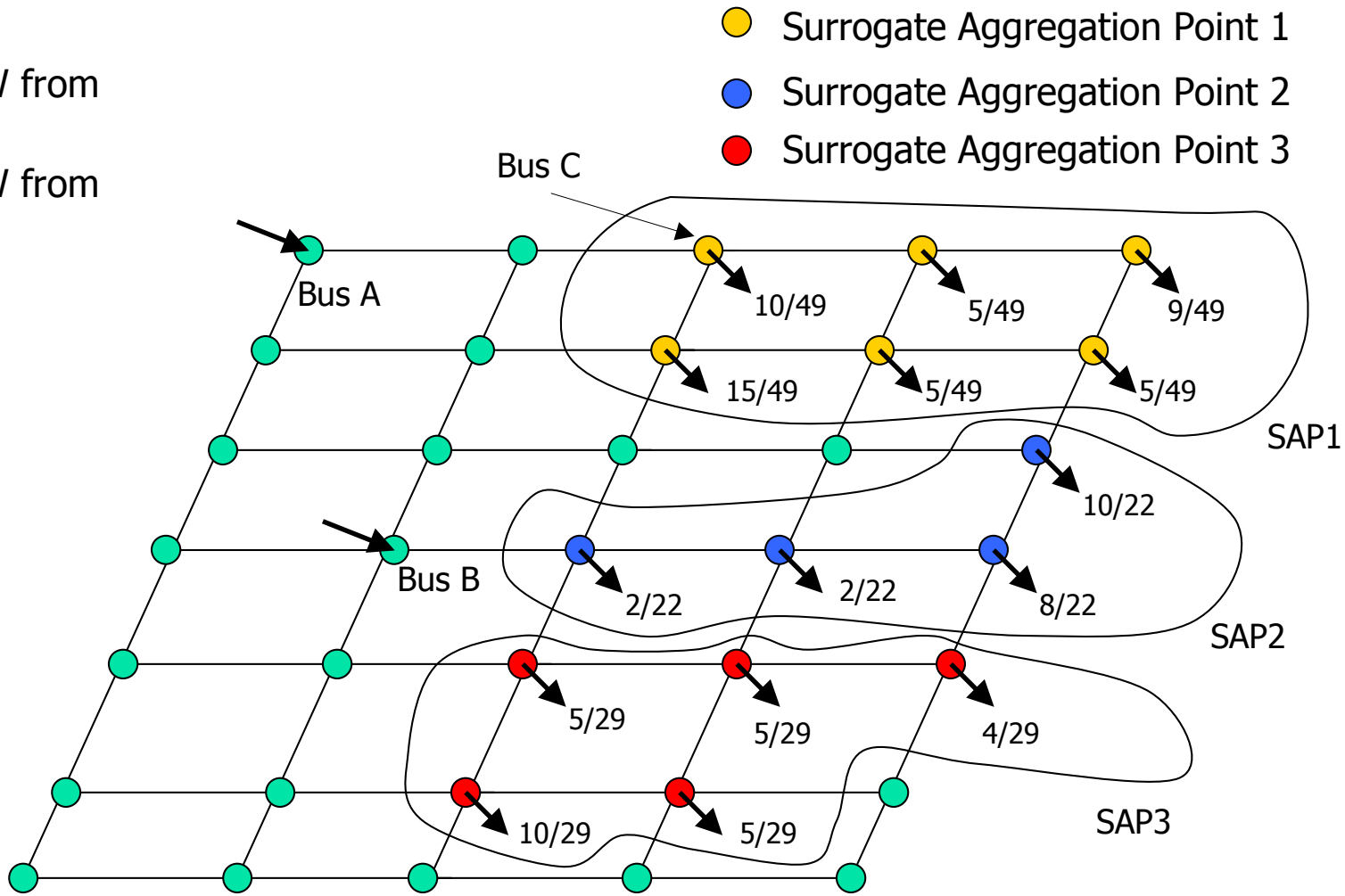

Surrogate Aggregations

- Surrogate Allocation Factors
  - SAP1
    - 49%
    - = 10% + 15% + 5% + 5% + 9% + 5%
  - SAP2
    - 22%
  - SAP3
    - 29%

Break Down of CRRs

- Based on the Surrogate Allocation Factors the CRRs are decomposed
- CRR1: Bus A to LAP1 of 100 MW
  - 3 new CRRs
  - Bus A to SAP1 of 49 MW (49% * 100 MW)
  - Bus A to SAP2 of 22 MW (22% * 100 MW)
  - Bus A to SAP3 of 29 MW (29% * 100 MW)
- CRR2: Bus B to LAP1 of 200 MW
  - 3 new CRRs
  - Bus B to SAP1 of 98 MW (49% * 200 MW)
  - Bus B to SAP2 of 44 MW (22% * 200 MW)
  - Bus B to SAP3 of 58 MW (29% * 200 MW)

Surrogate Aggregations

- The Allocation Factors of each Surrogate Aggregation Points are derived by re-normalizing the original Allocation Factors with respect to the Surrogate Aggregations
- For example
  - SAP1 – there are 6 nodes in SAP1
  - Total percentage to original LAP is 49%
  - Surrogate Allocation Factors are
    - 10/49
    - 15/49
    - 5/49
    - 5/49
    - 9/49
    - 5/49

Surrogate Aggregations

- The *initial* MW amount of injection and withdrawal are the same with the large Load Aggregation Points or the Surrogate Aggregation Points
- Take Bus C for example for CRR1 (100 MW)
  - LAP1 (from LAP1 to Bus C)
    - Bus C withdrawal = 100 MW * 10% = 10 MW
  - SAP1
    - 100 MW * 49% = 49 MW (from LAP1 to SAP1)
    - 49 MW * (10/49) = 10 MW (From SAP1 to Bus C)
- The difference is when reductions are made in the SFT to relieve any constraints
- The new CRRs based on the Surrogate Aggregation Points are independent of each other

Surrogate Aggregations

Reductions: **Assume** the following reductions using the Surrogate Aggregations

CRR1:	Initial	Reduced Amount	Final
SAP1	49	10	39
SAP2	22	2	20
SAP3	29	0	29
CRR2:			
SAP1	98	8	90
SAP2	44	4	40
SAP3	58	18	40

Surrogate Aggregations

- There is a significant gain in the clearing of CRR MW
- Original reduction of 60 + 90 = 150 MW
- With Surrogate Aggregations 12 + 30 = 42 MW

Surrogate Aggregations

Final Surrogate percentages relative to each other

	SAP1	SAP2	SAP3
CRR1	80%	91%	100%
CRR2	92%	91%	69%

Surrogate Aggregations

- What to do with the final Surrogate CRRs?
- Should they be combined?
  - Add the MW back up to the LAP level
  - For example for CRR1
    - CRR from Bus A to LAP1 of (39 + 20 + 29 = 88 MW)
  - The CRR is then from the Source to the LAP
- Should the CRRs stay at the Surrogate level?
  - For settlements need to calculate Surrogate Aggregate prices and then settle the CRR revenue stream based on these prices