Regional Factor Decision for Phase 6

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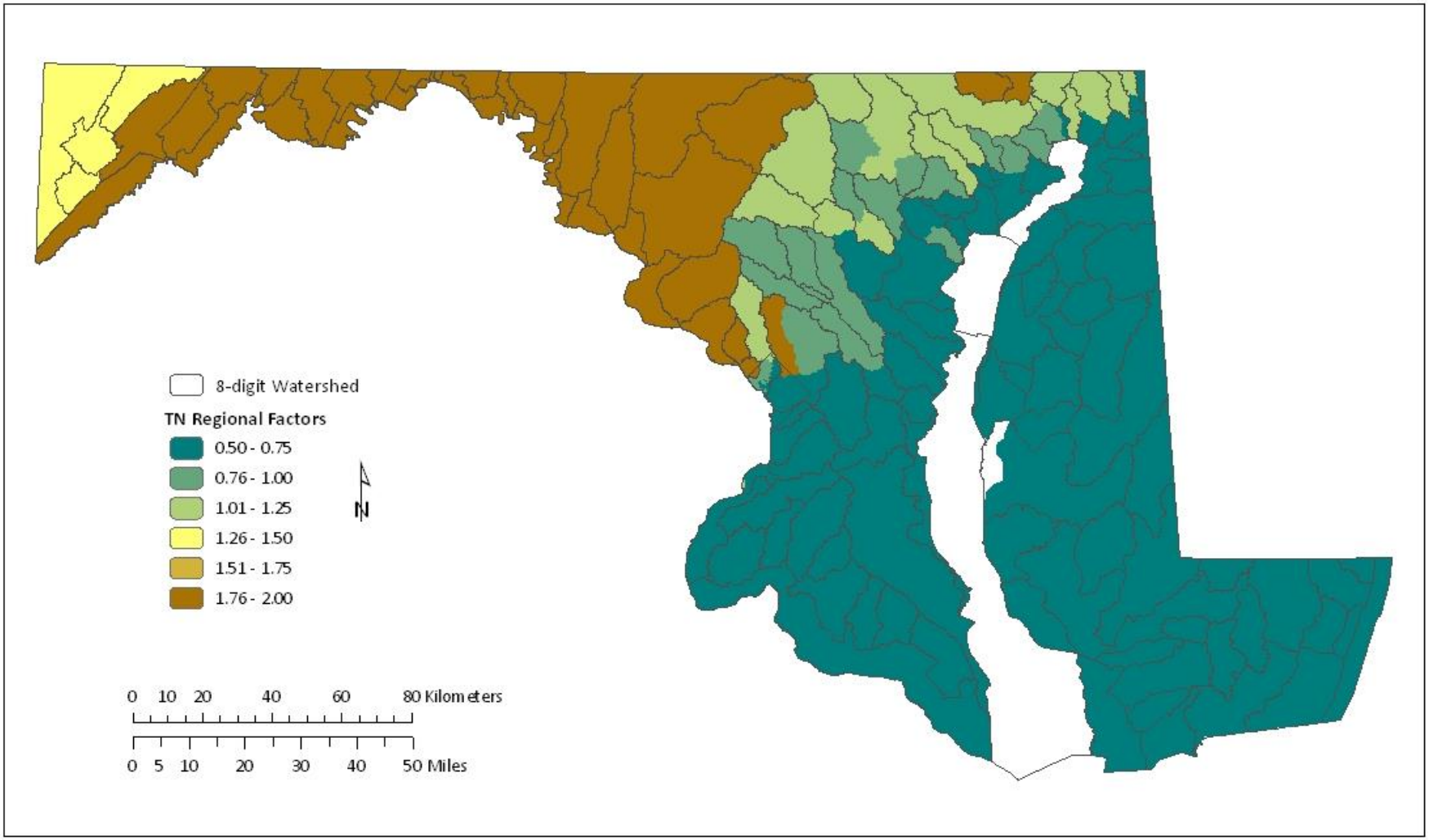
ModWG 5/18/2017

Regional Factors

- CBP-specific terminology
- Loading factors that are applied equally to all nonpoint sources upstream of a monitoring station to improve load calibration
- Ad-hoc use in Phase 2 and Phase 4
- Systematic use in Phase 5

P532 TN Regional Factors In MD



MD points out that regional factors vary over the state, resulting in variability in pound per acre loads between counties, which has implications for communicating results and for trading.





Phase 6 Model Structure

Average Load + Δ Inputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

Stream Delivery

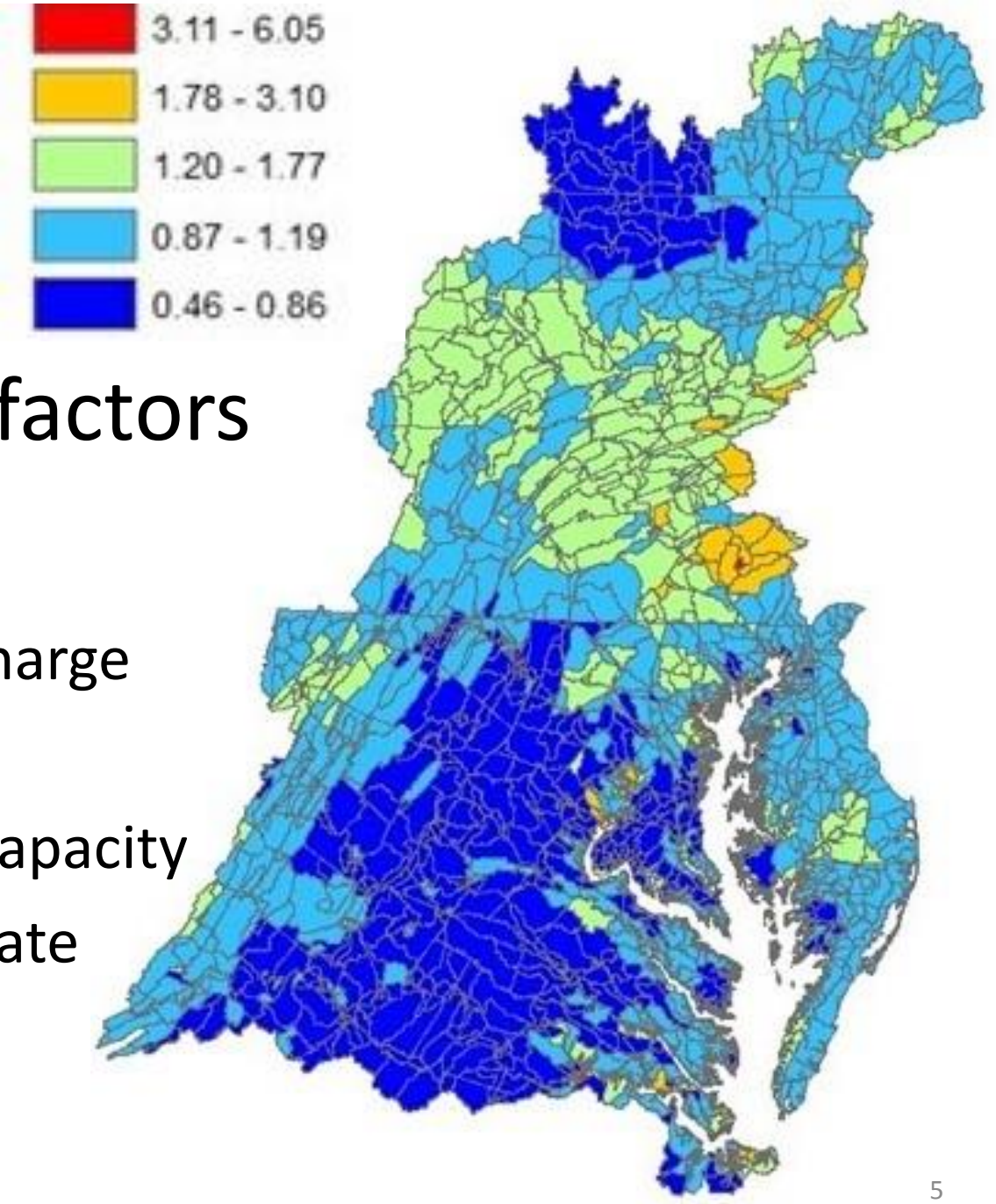
*

River Delivery

Direct Loads

Phase 6

Sparrow-calculated Land to Water factors



- Due to
  - Groundwater recharge
  - Vegetative Index
  - Available Water Capacity
  - Piedmont Carbonate

Questions to be asked in May

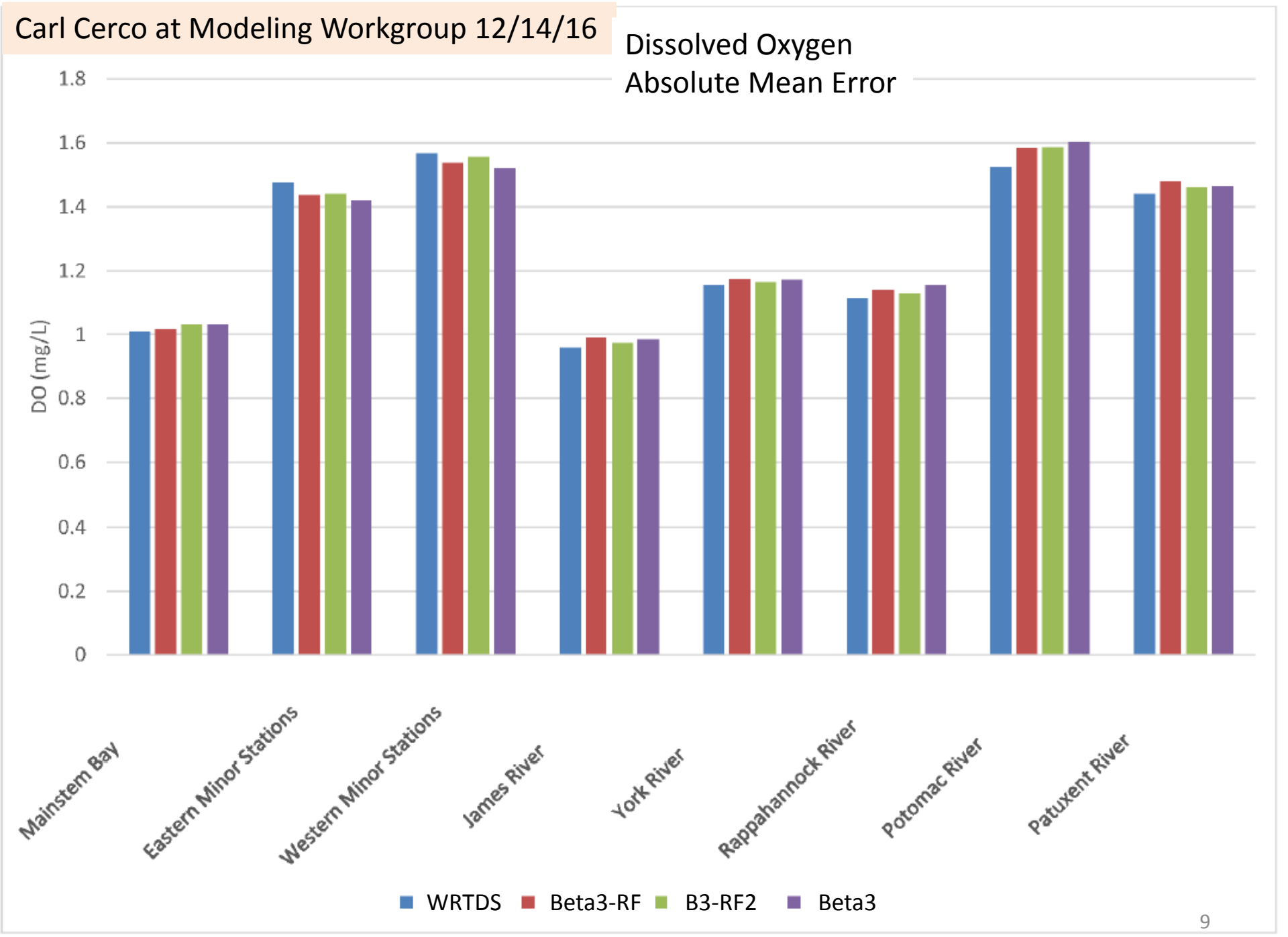
- Were we successful in our attempt to avoid using calibrated regional factors?
- Is the calibration without calibrated regional factors as good as the Phase 5 calibration with calibrated regional factors?
- Would any gain in load accuracy with the addition of calibrated regional factors be worth the loss in explanatory power?

Considerations

- Uses
  - Load the WQSTM
  - Determine the assimilative capacity
  - Develop Planning targets
- Precedent
  - Comparison to Phase 5

Four Options

- Option 1: Loads at RIM stations from WRTDS (USGS regression program).
- Option 2a: Phase 6 Beta 3 Total N and Total P loads corrected based on WRTDS. (We are calibrating the WQSTM to this load set.)
- Option 2b: Phase 6 Beta 3 individual species corrected based on WRTDS.
- Option 3: Pure, unadulterated Phase 6 Beta 3 loads.


Dissolved Oxygen
Absolute Mean Error
DO (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Mainstem Bay
Eastern Minor Stations
Western Minor Stations
James River
York River
Rappahannock River
Potomac River
Patuxent River
WRTDS
Beta3-RF
B3-RF2
Beta3

Conclusions

- No representation of loads clearly and consistently produces the best model results.
- WRTDS loads result in superior computations of mainstem DO and chlorophyll.
- There is no clear advantage to adjusting Phase 6 Beta 3 loads to match WRTDS loads.
- In some cases, the adjustment process results in anomalous loads and deteriorated model results. My recommendation is forego the adjustment procedure.

Considerations

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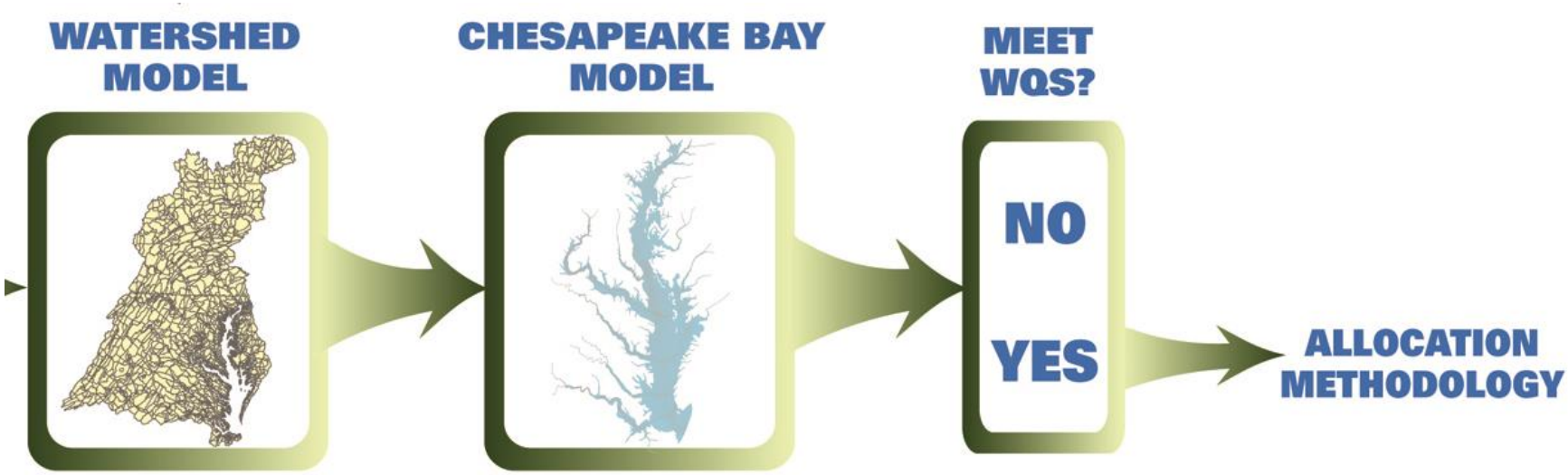
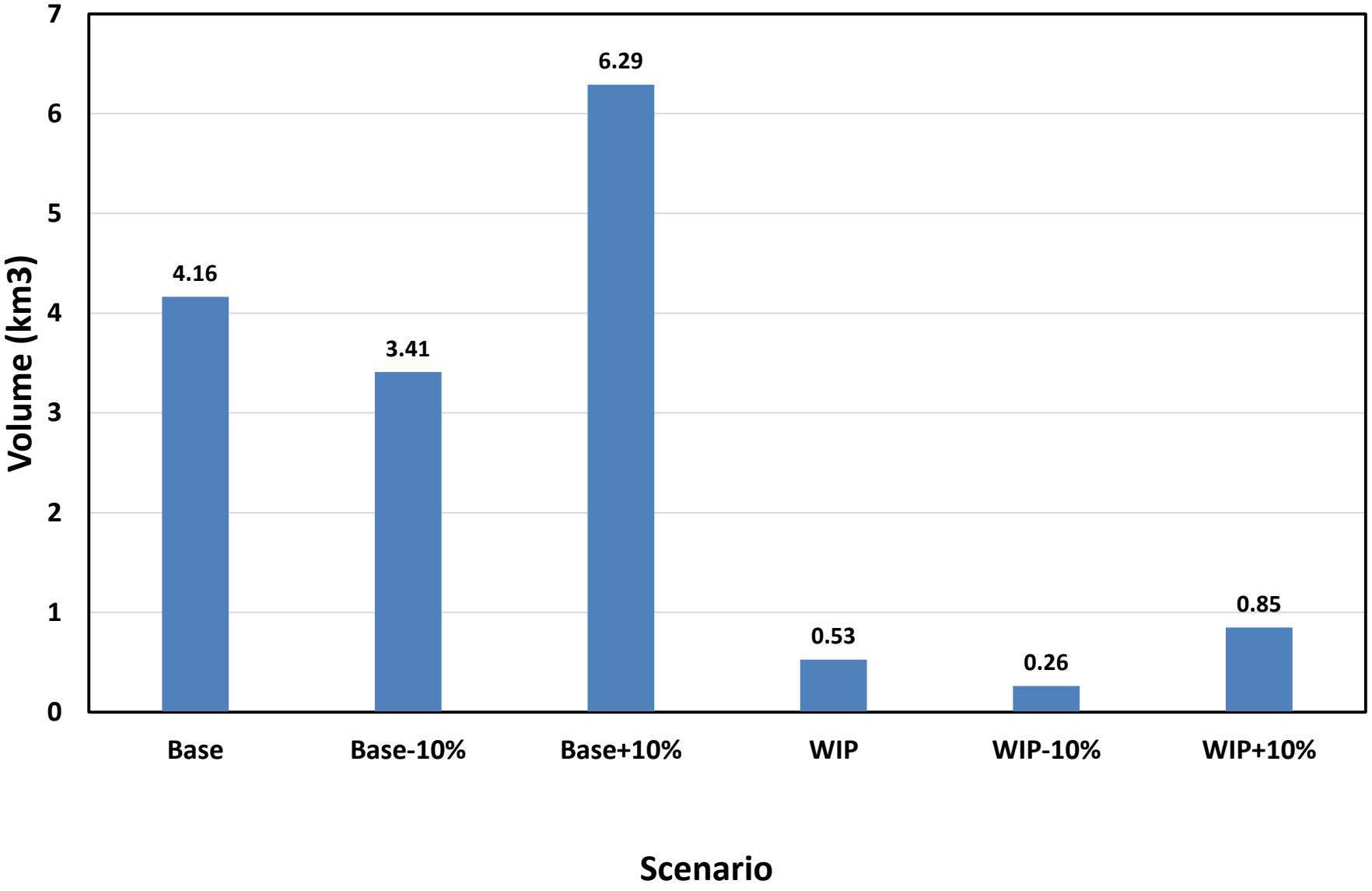
Assimilative Capacity



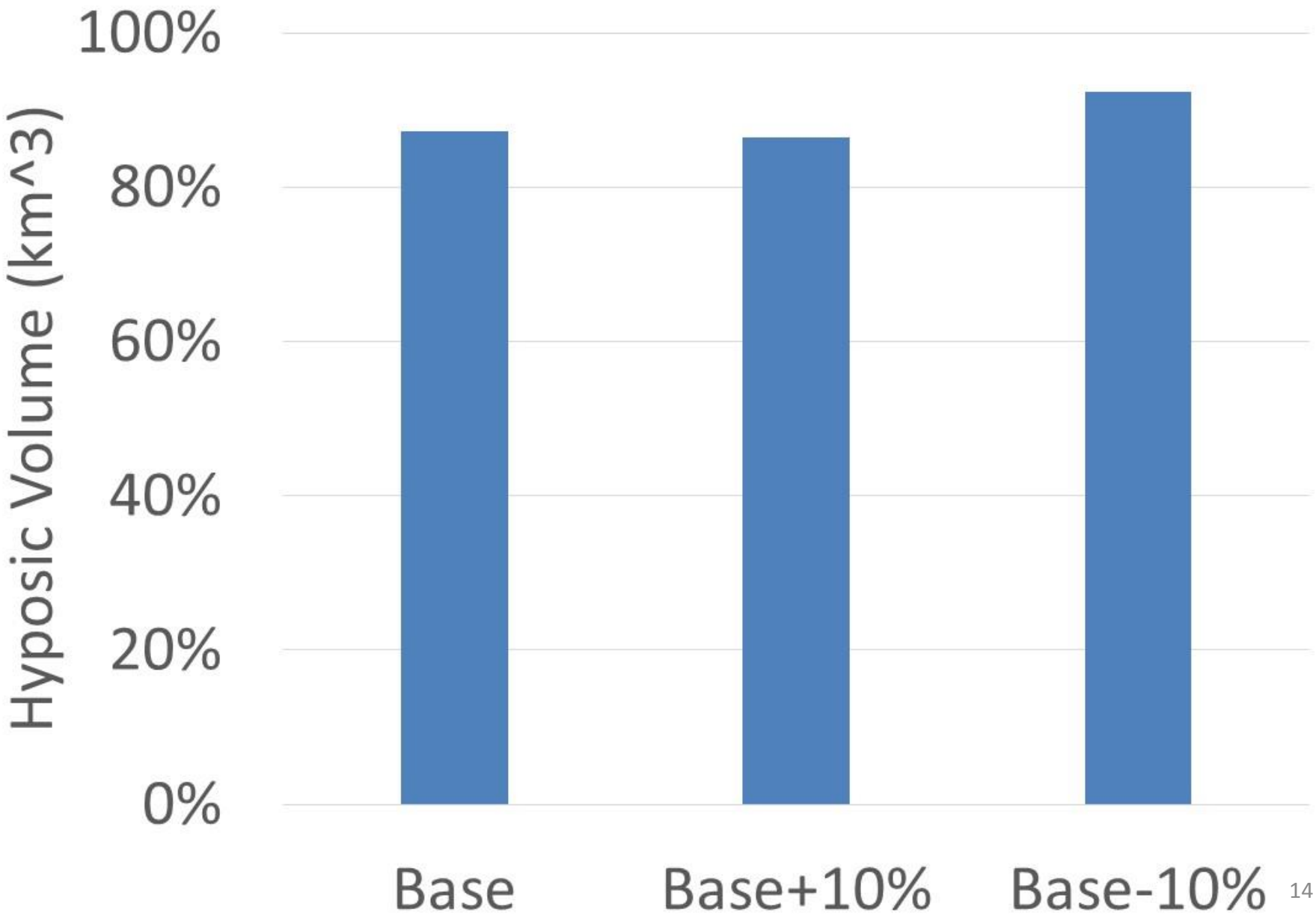
Should deliver accurate loads for calibration

…but this method is an estimate of relative change

Hypoxia Volume Whole Bay 1993-1995

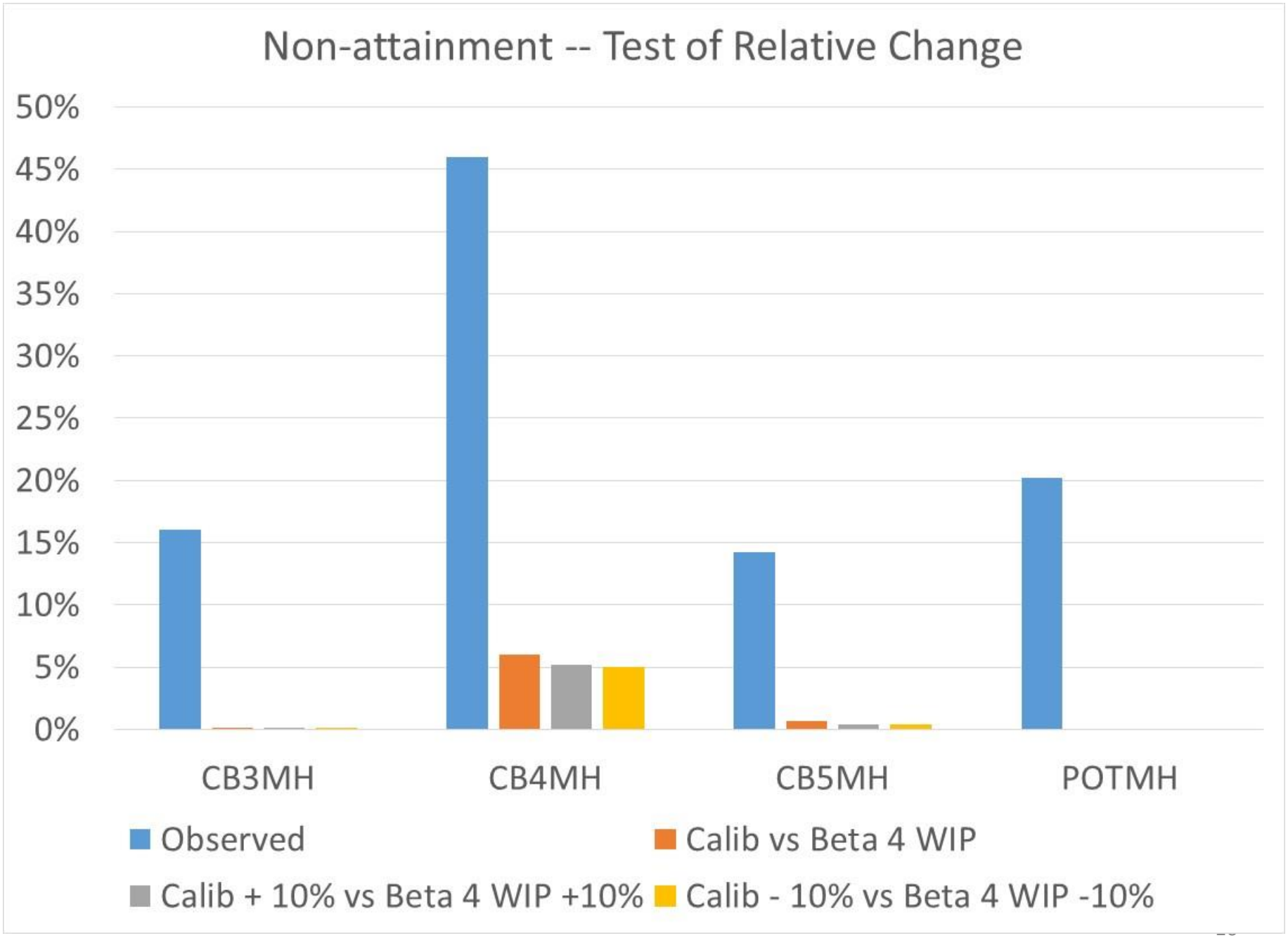


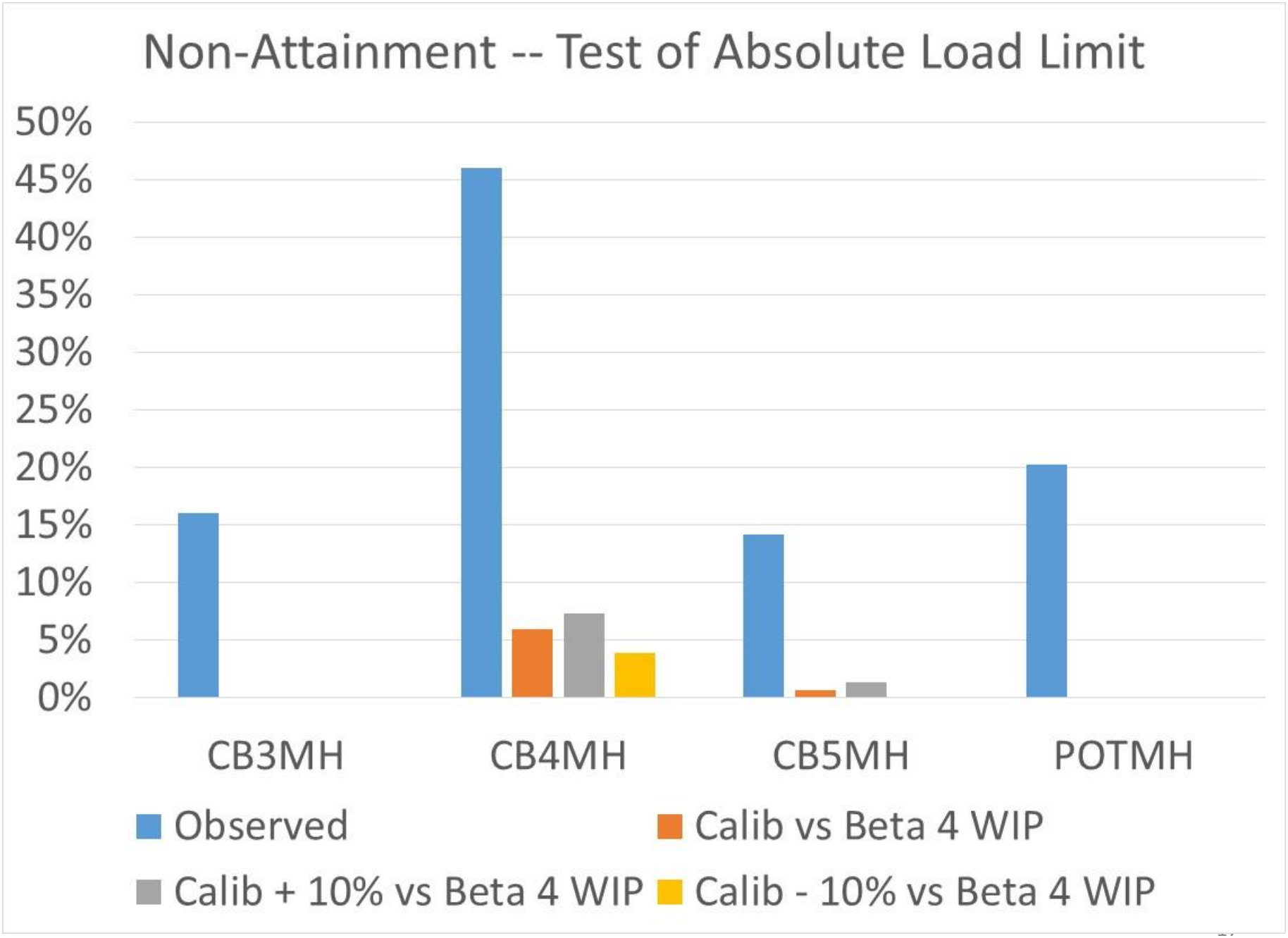
WIP Hypoxic Volume Reduction



Deep water 1993-1995

		OLS					Percentile				
		Beta4TMDL	Beta4TMDL-10% calib-10%	Beta4TMDL+10% calib+10%	Beta4TDMLvsCalib-10%	Beta4TDMLvsCalib+10%	Beta4TMDL	Beta4TMDL-10% calib-10%	Beta4TMDL+10% calib+10%	Beta4TDMLvsCalib-10%	Beta4TDMLvsCalib+10%
CB3MH	MD	0.07%	0.05%	0.05%	0.09%	0.01%	0.06%	0.05%	0.03%	0.06%	0.01%
CB4MH	MD	5.98%	5.21%	5.03%	7.35%	3.86%	5.59%	4.98%	4.31%	7.22%	3.16%
CB5MH	MD/VA	0.65%	0.39%	0.43%	1.32%	0.06%	0.70%	0.58%	0.39%	1.01%	0.03%
CB6PH	VA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB7PH	VA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	MD	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EASMH	MD	0.45%	0.11%	0.86%	0.50%	0.42%	0.02%	0.02%	0.00%	0.07%	0.00%
PAXMH	MD	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%
POTMH	MD/VA	0.00%	0.00%	0.00%	0.04%	0.00%	0.42%	0.41%	0.21%	0.65%	0.05%
POMMH	MD	0.00%	0.00%	0.00%	0.04%	0.00%	0.43%	0.41%	0.22%	0.66%	0.05%
RPPMH	VA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SBEMH	VA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
YRKPH	VA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MD5MH	MD	1.65%	1.18%	1.30%	2.76%	0.62%	1.87%	1.58%	1.12%	2.40%	0.24%
VA5MH	VA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PATMH	MD	0.12%	0.01%	0.24%	0.51%	0.01%	0.31%	0.02%	0.13%	0.31%	0.02%


Non-attainment -- Test of Relative Change
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
CB3MH
CB4MH
CB5MH
POTMH
Observed
Calib vs Beta 4 WIP
Calib + 10% vs Beta 4 WIP +10%
Calib - 10% vs Beta 4 WIP -10%


Non-Attainment -- Test of Absolute Load Limit
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
CB3MH
CB4MH
CB5MH
POTMH
Observed
Calib vs Beta 4 WIP
Calib + 10% vs Beta 4 WIP
Calib - 10% vs Beta 4 WIP

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- Precedent
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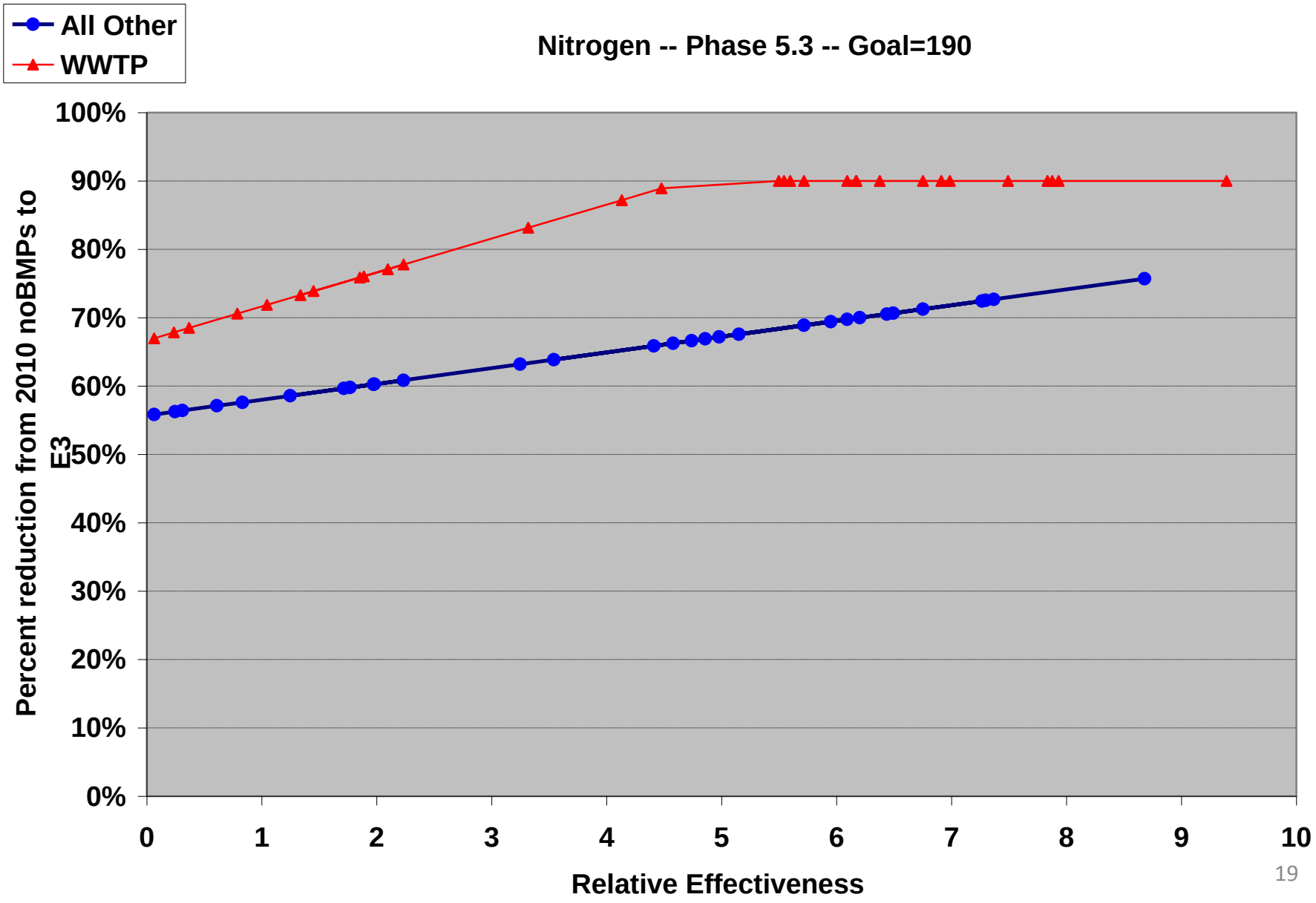
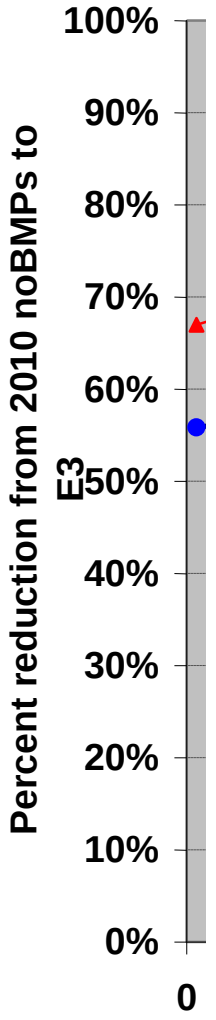
Develop Planning Targets



Develop Planning Targets

- Percent reduction from No Action to E3
- Relative Change



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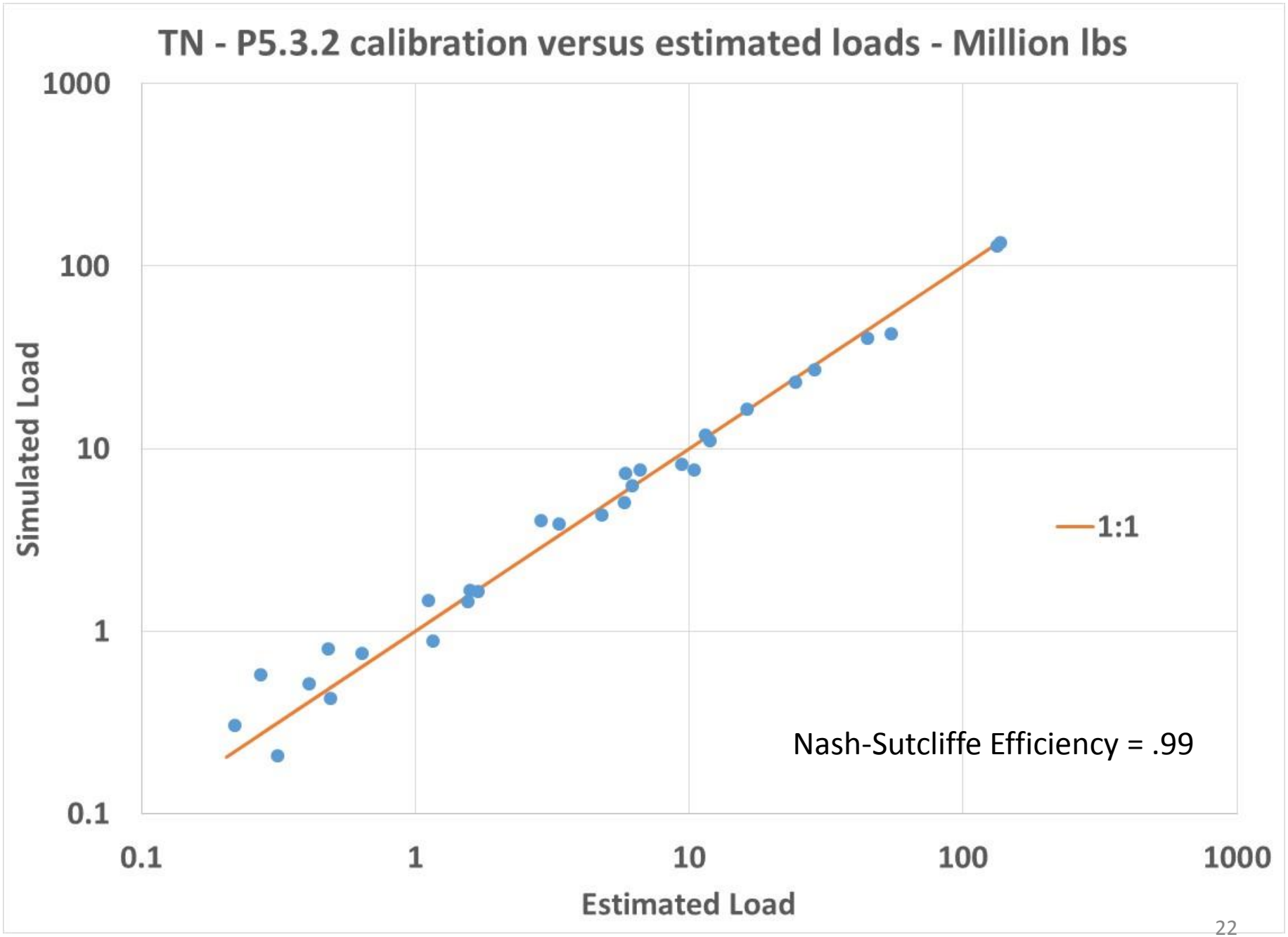
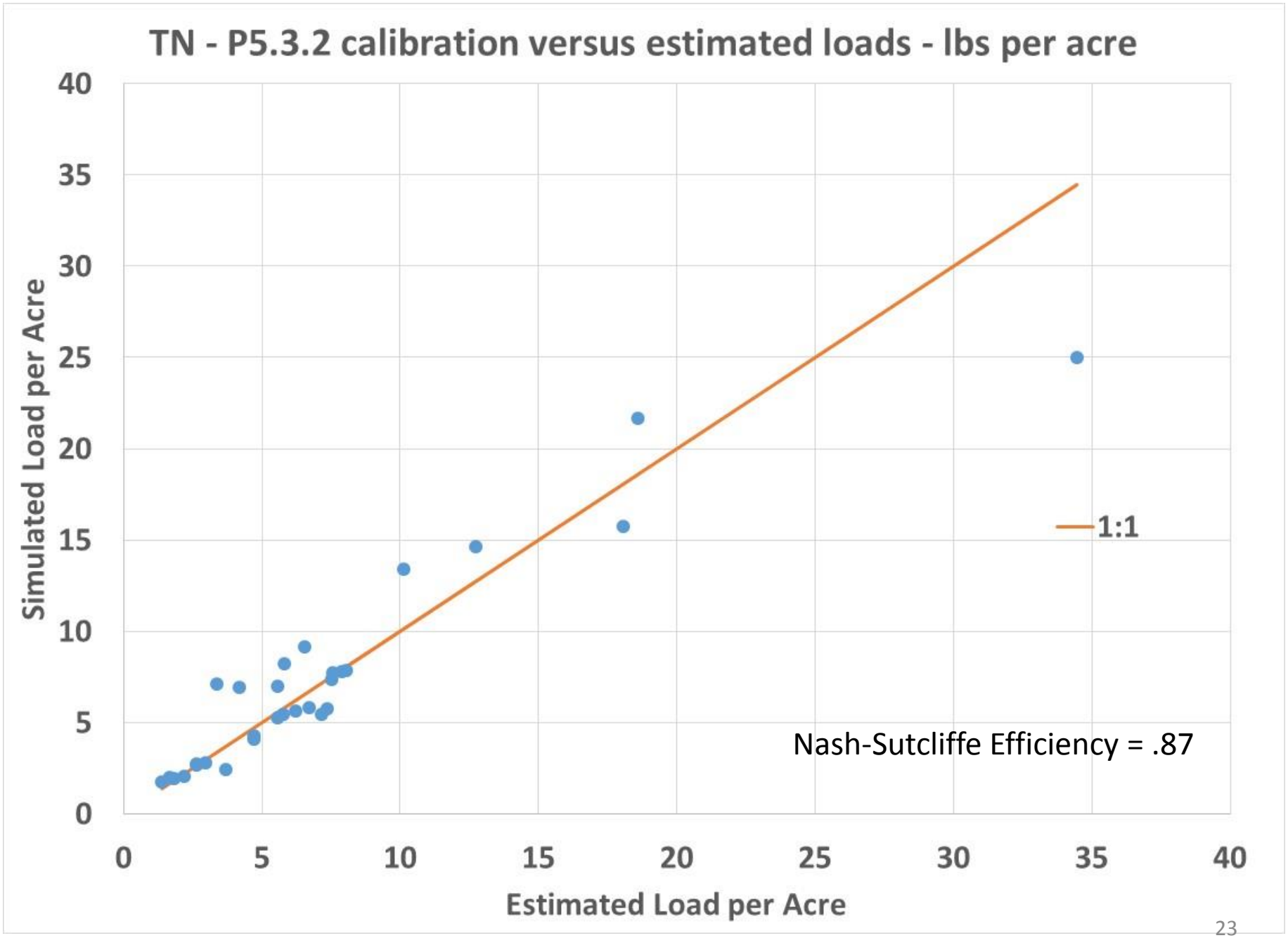
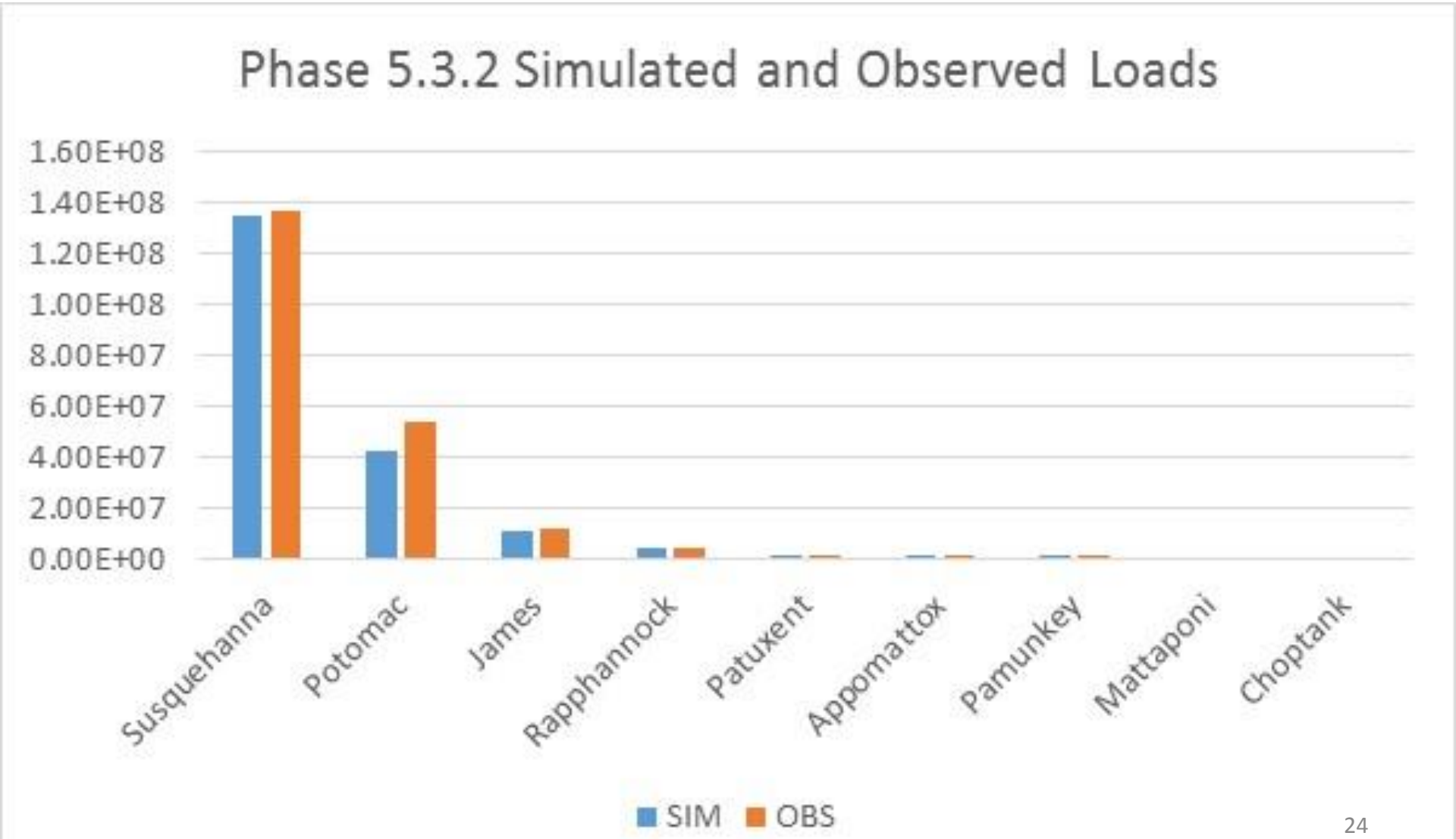
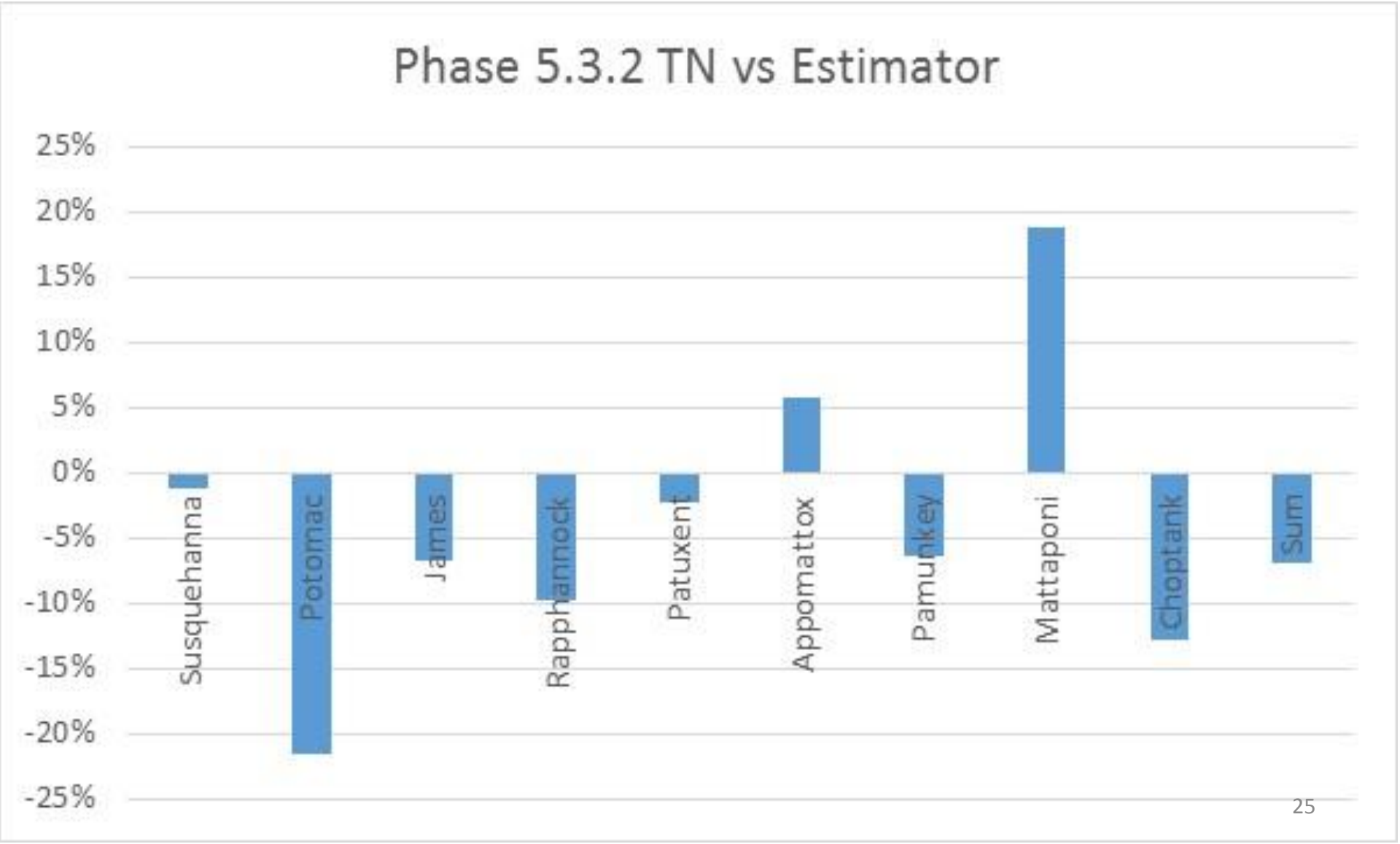

TN - P5.3.2 calibration versus estimated loads - Million lbs
1000
100
10
1
0.1
Simulated Load
0.1
1
10
100
1000
Estimated Load
1:1
Nash-Sutcliffe Efficiency = .99


TN - P5.3.2 calibration versus estimated loads - lbs per acre
Simulated Load per Acre
Estimated Load per Acre
0
5
10
15
20
25
30
35
40
1:1
Nash-Sutcliffe Efficiency = .87

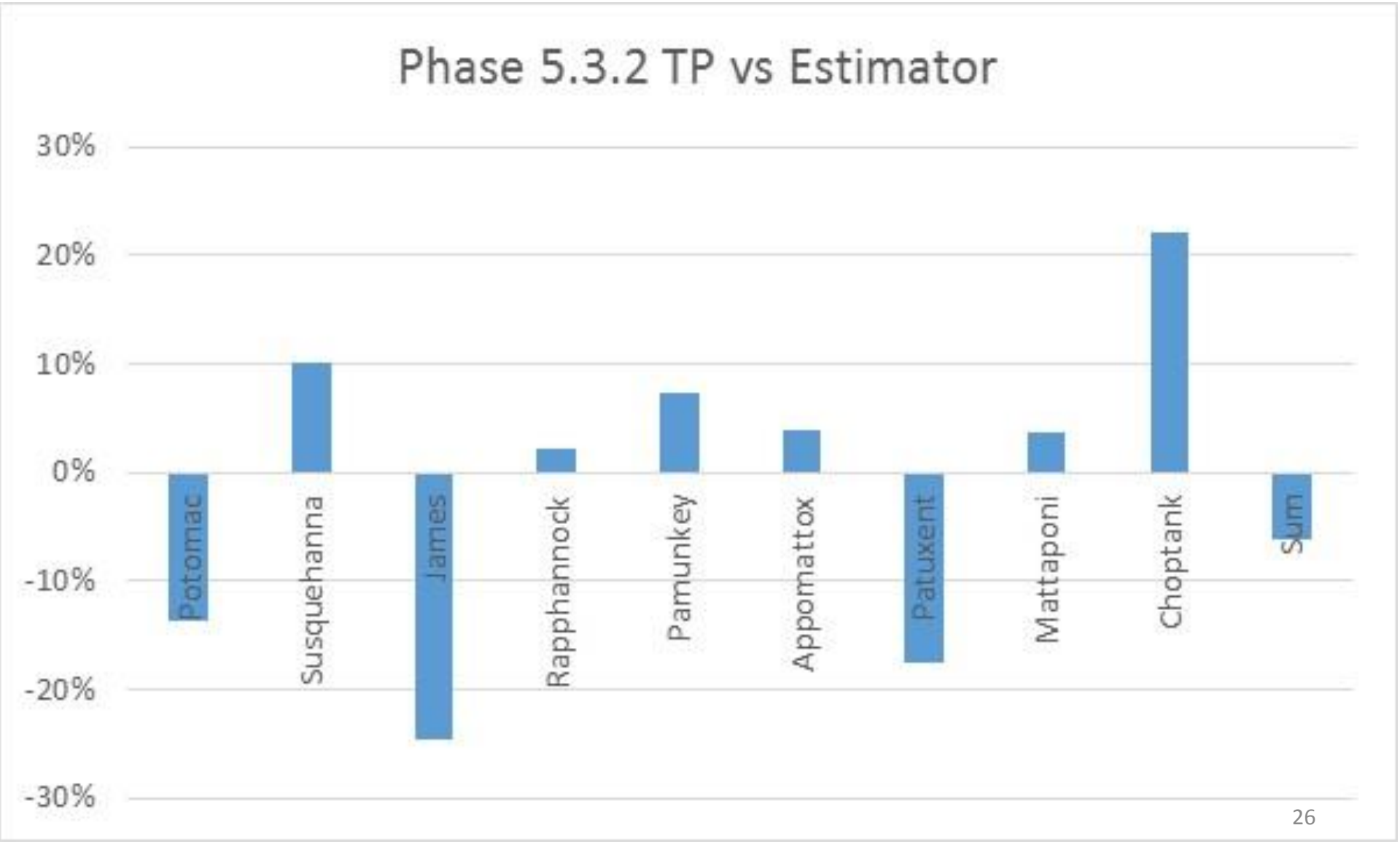
RIM station Load



RIM station Load



RIM station Load



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