

ERTAC EGU Growth Model Compare/Contrast with IPM

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Origins and Methods of ERTAC EGU Group

- ERTAC EGU group convened 4 years ago
- Project goal:
 - Build a low cost, stable, fast, and transparent alternative to the IPM model to project future EGU emissions.
- Participants: States, MJOs, Industry reps.
- EPA is being kept informed

Attributes of ERTAC Model

- Conservative – no big swings in power generation.
- Data intensive – needs substantial state-supplied data.
- Regional and fuel modularity.
- Calculates future hourly estimates based on base year activity.
- Test hourly reserve capacity.
- Quickly evaluates various scenarios;
 - e.g., unit retirement, growth, and control

Open and Transparent

- Code is transferrable to state staff with knowledge of Perl, SQL-lite
- Code is not proprietary; available at no cost.
- Currently, at least one state in MW, NE, and SE regions is running the model.
- Currently some states are adding CO2/GHG to the model.

How the Model Works

- Unit-level inventory of EGUs (capacity, fuel type, controls, hourly CEMs data for base year).
- Apply EIA-AEO growth rates by region and fuel type (model does not transfer generation between regions or between fuels).
- Model matches available capacity to projected demand; creates “demand deficit” units if demand exceeds capacity.
- For units that exceed hourly or annual capacity limits, add generation to Excess Generation Pool.
- Empty Excess Generation Pool to other available units.
- Calculate emissions and convert to SMOKE and create reports (model does not generate new controls).

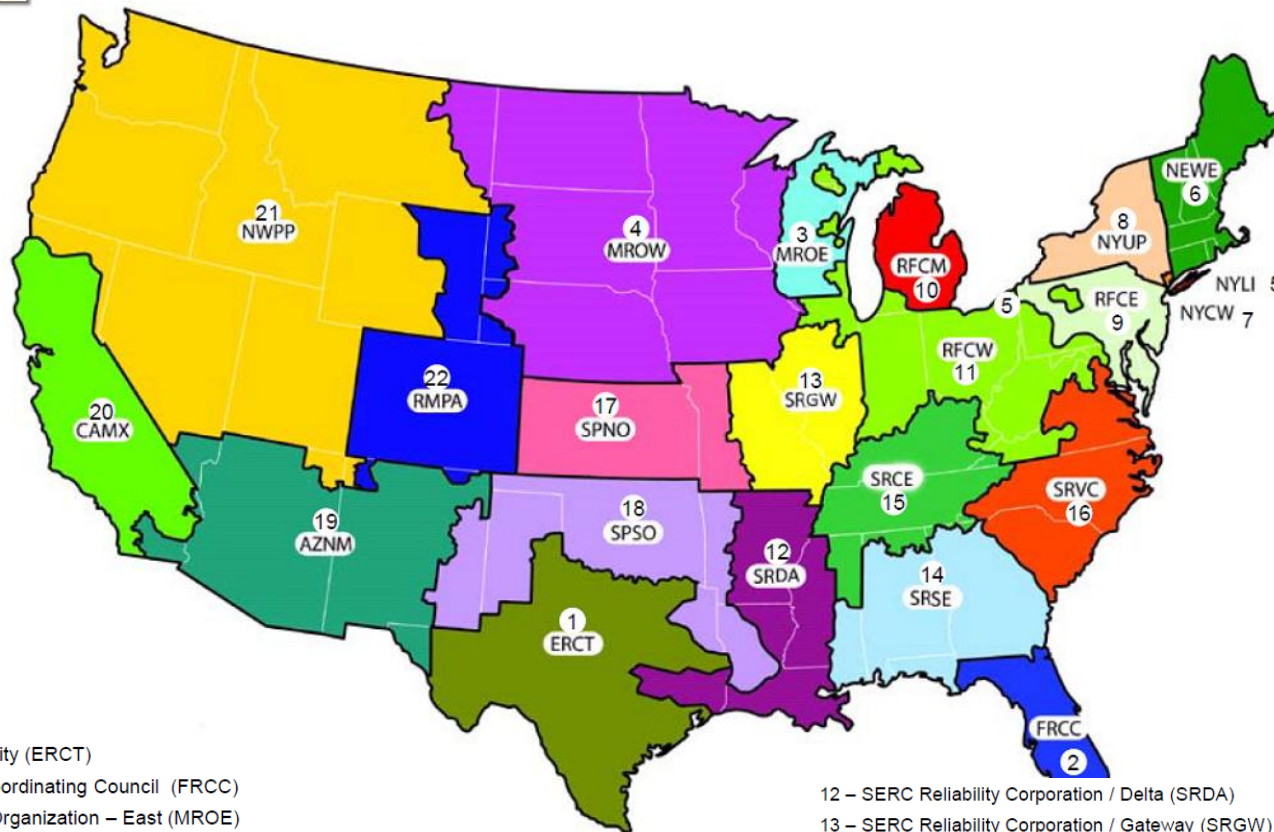
Project Timeline

- 2010-2012 – model development and testing.
- December 2012 - Present model to EPA.
- August 2013– completed Version 1.7 run, Last 2007 base year and 2013 AEO growth rates.
- December 2013 – complete Version 2.1 with significant updates from states with 2011 base year
- Dec 2013 – Comparison of IPM and ERTAC Model
- Summer 2014 – Test Alternate Growth and MATS scenarios, (transport scenarios???)

EIA EMM(NEMS) Map – 2011, 2012, 2013

Electricity Market Module Regions

NEMS22Reg

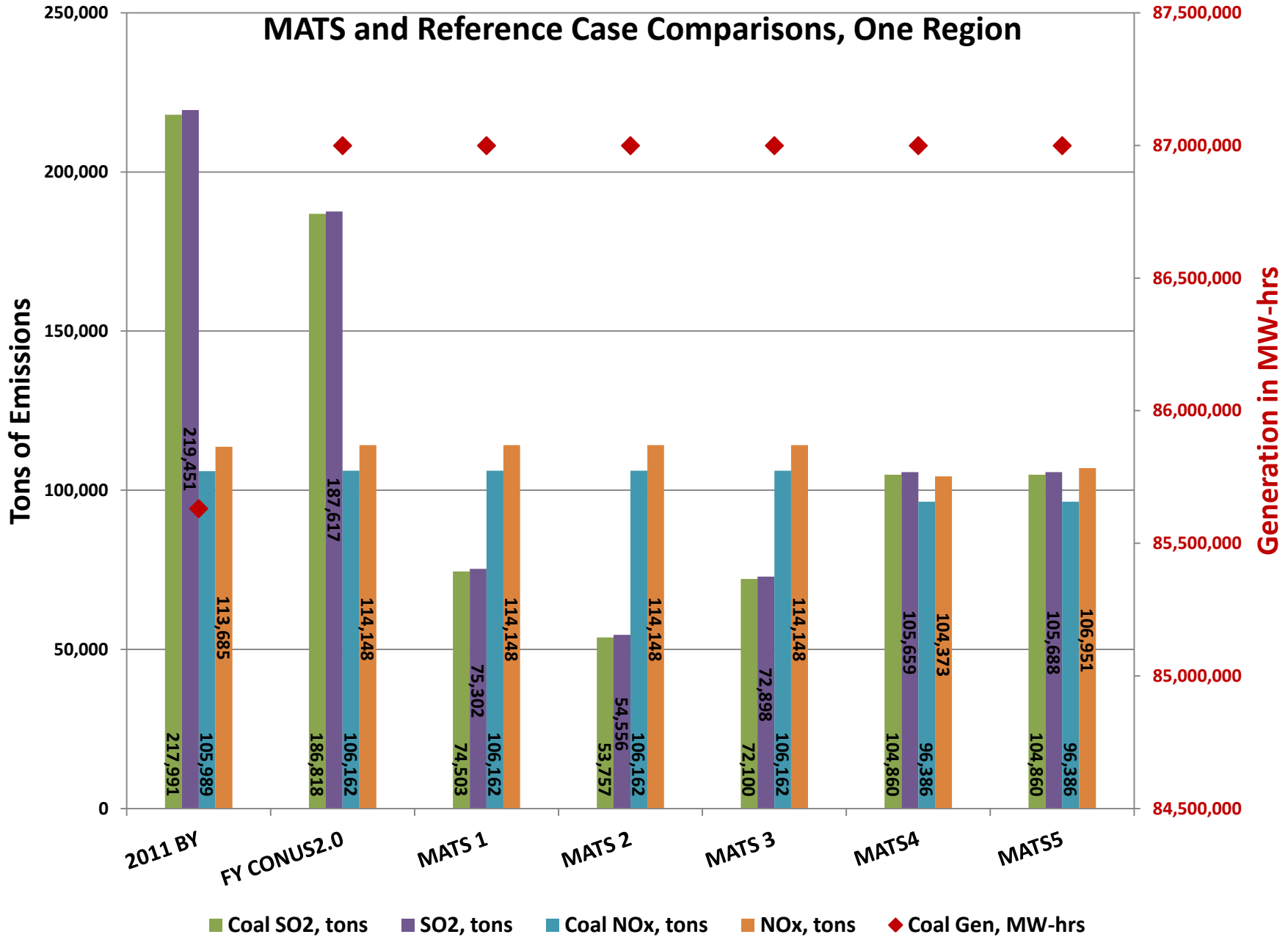


- 1 – Texas Reliability Entity (ERCT)
- 2 – Florida Reliability Coordinating Council (FRCC)
- 3 – Midwest Reliability Organization – East (MROE)
- 4 – Midwest Reliability Organization – West (MROW)
- 5 – Northeast Power Coordinating Council / Northeast (NEWE)
- 6 – Northeast Power Coordinating Council / NYC – Westchester (NYCS)
- 7 – Northeast Power Coordinating Council / Long Island (NYLI)
- 8 – Northeast Power Coordinating Council / Upstate New York (NYUP)
- 9 – Reliability First Corporation/ East (RFCE)
- 10 – Reliability First Corporation/Michigan (RFCM)
- 11 – Reliability First Corporation/West (RFCW)
- 12 – SERC Reliability Corporation / Delta (SRDA)
- 13 – SERC Reliability Corporation / Gateway (SRGW)
- 14 – SERC Reliability Corporation / Southeastern (SRSE)
- 15 – SERC Reliability Corporation / Central (SRCE)
- 16 – SERC Reliability Corporation / Virginia-Carolina (SRVC)
- 17 – Southwest Power Pool Regional Entity / North (SPNO)
- 18 – Southwest Power Pool Regional Entity / South (SPSO)
- 19 – Western Electricity Coordinating Council / Southwest (AZNM)
- 20 – Western Electricity Coordinating Council / California (CAMX)
- 21 – Western Electricity Coordinating Council / Northwest Power Pool Area (NWPP)
- 22 – Western Electricity Coordinating Council / Rockies (RMPA)

Integrated Planning Model(IPM)

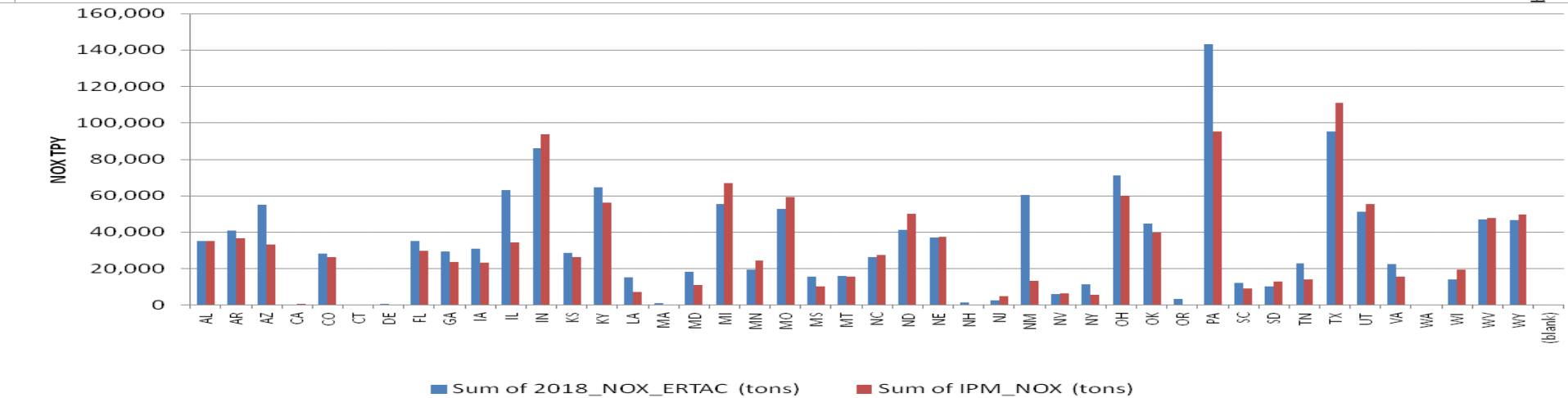
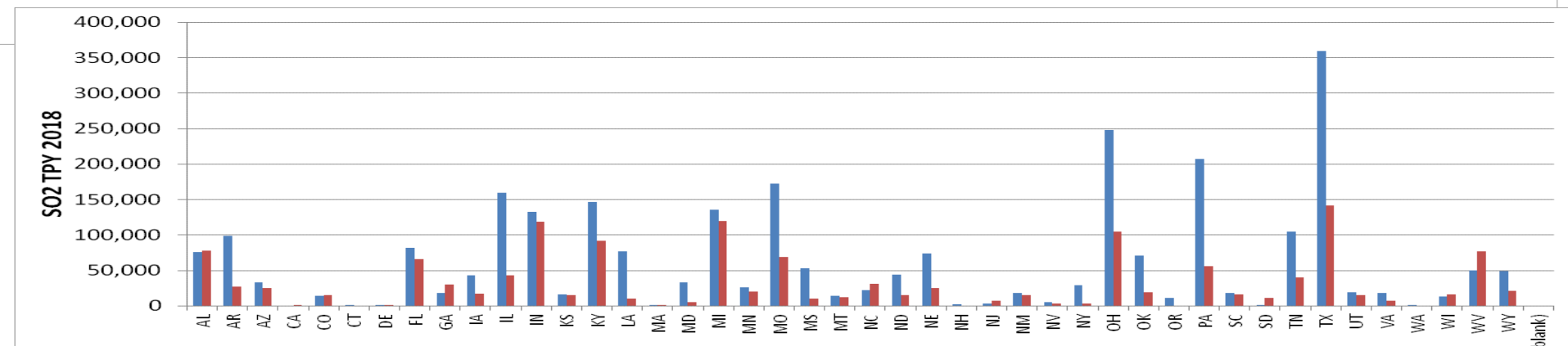
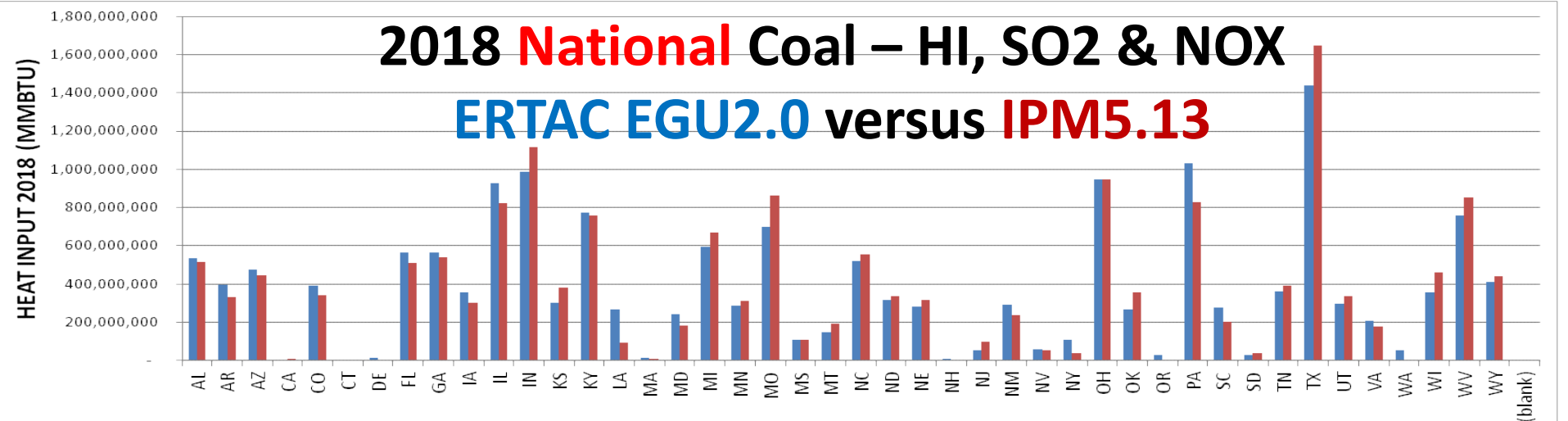
- IPM Primarily Economic model(Fuels, Markets, Distribution)
- Solves for peak day, average day(not real/episode days)
- Use National growth rate. State and fuel distribution based on economics.
- Results are then draped over existing CEM based inventory(no beyond capacity check)
- Shutdowns can have impact on budgets and are difficult to recover from.(CAIR and Alabama)
- Proprietary and Expensive.

MATS and Reference Case Comparisons, One Region



2018 National Coal – HI, SO2 & NOX

ERTAC EGU2.0 versus IPM5.13

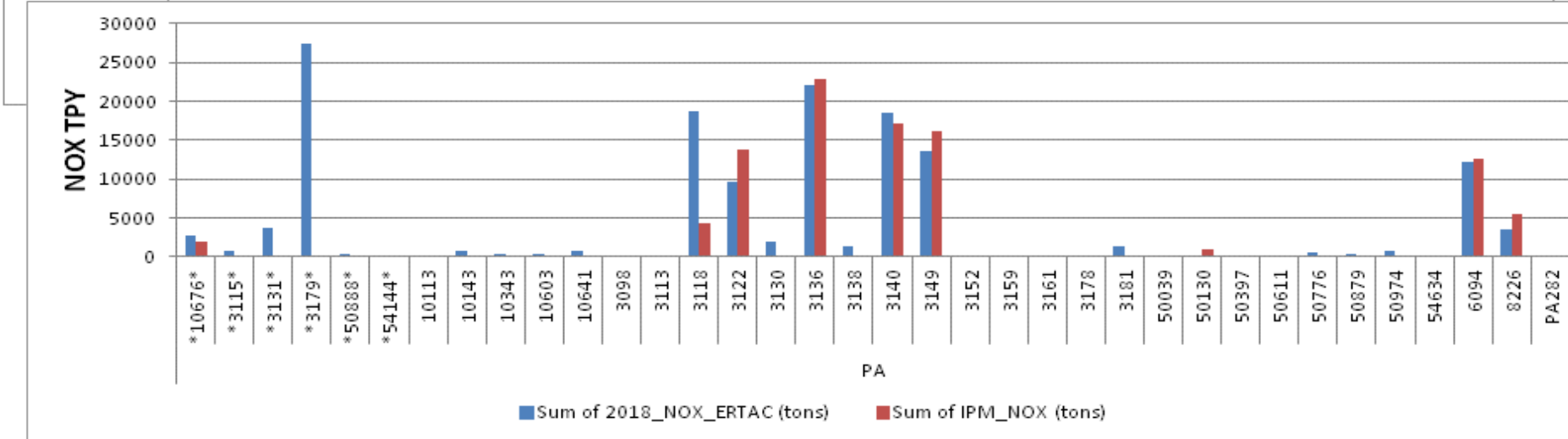
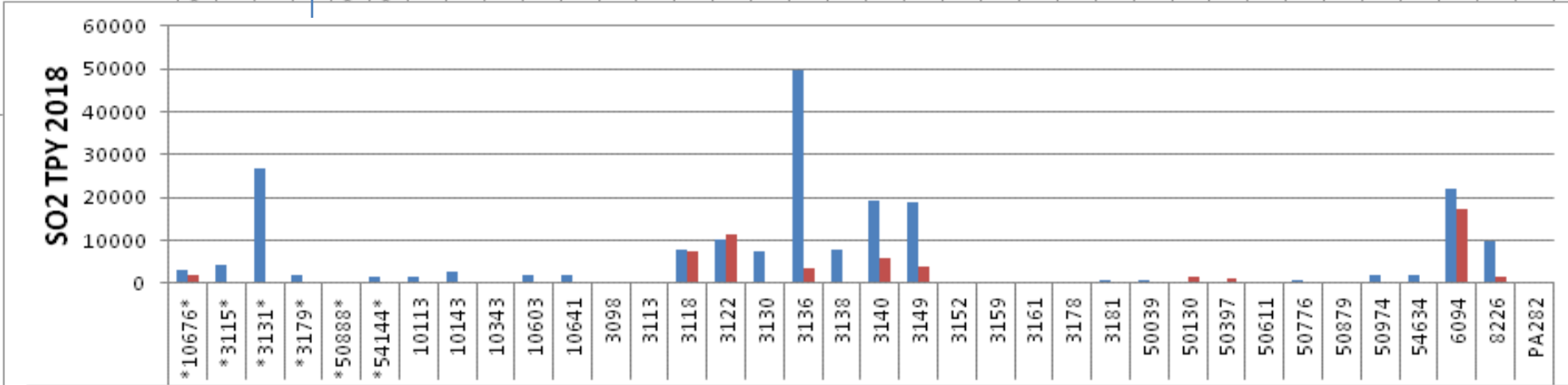
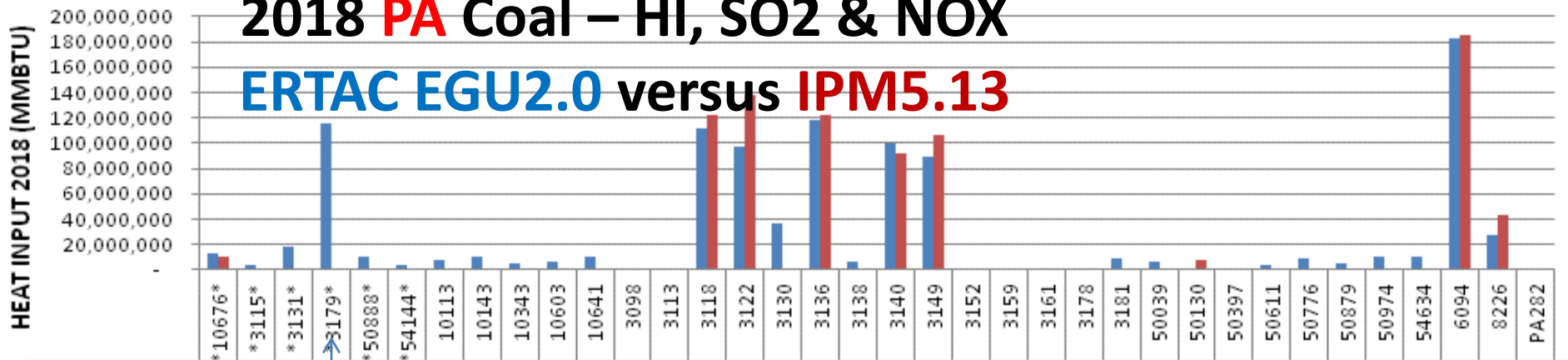


Sum of 2018_NOX_ERTAC (tons)

Sum of IPM_NOX (tons)

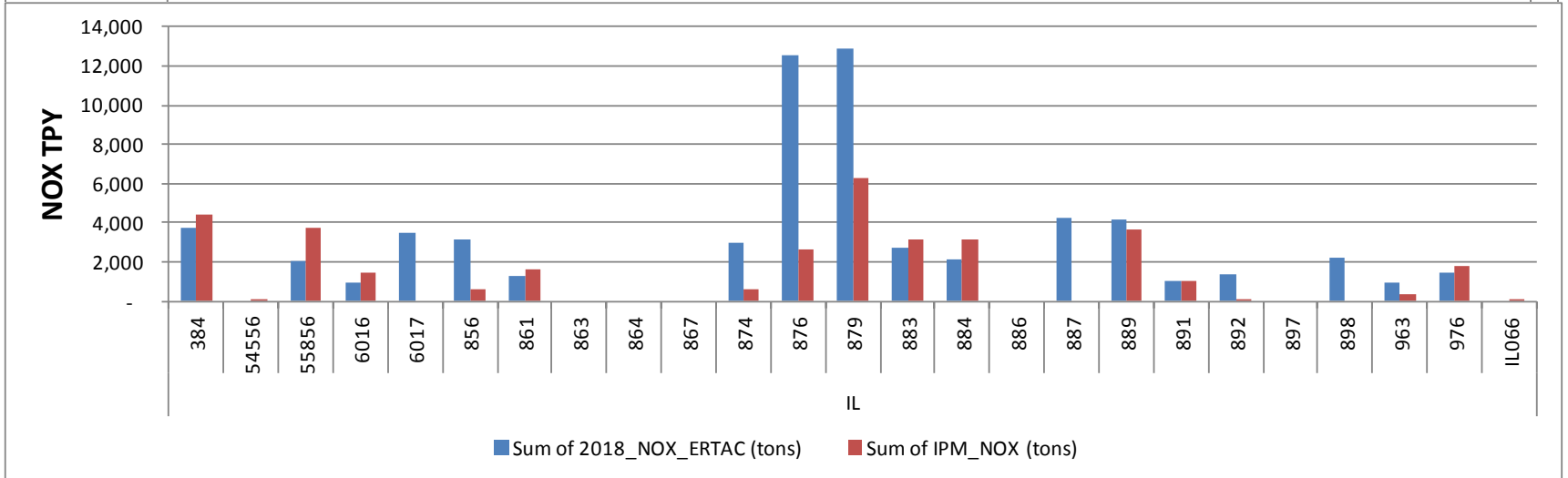
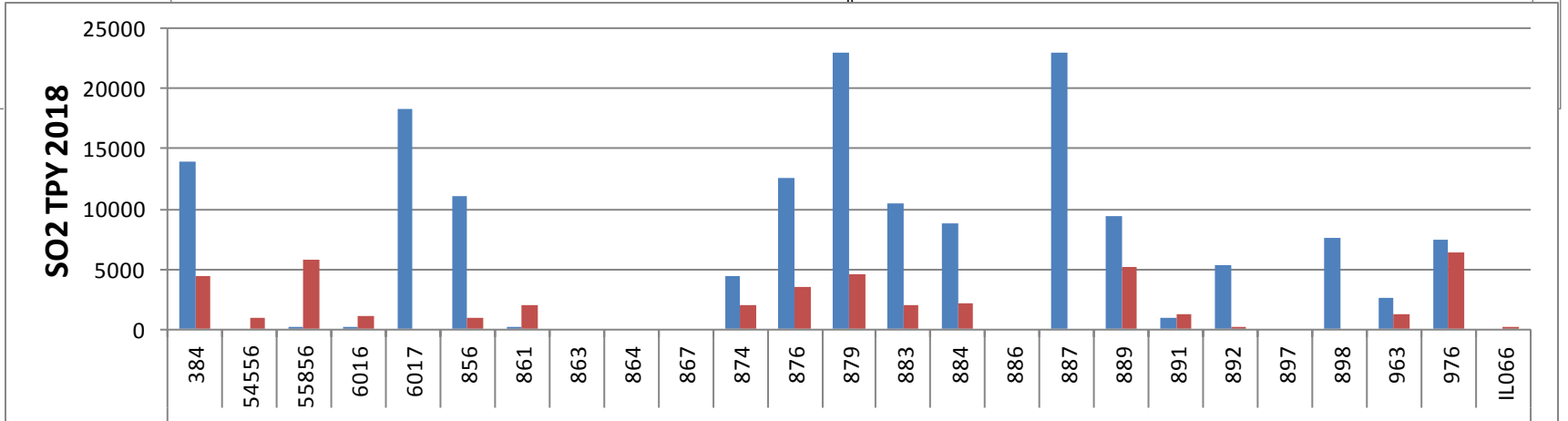
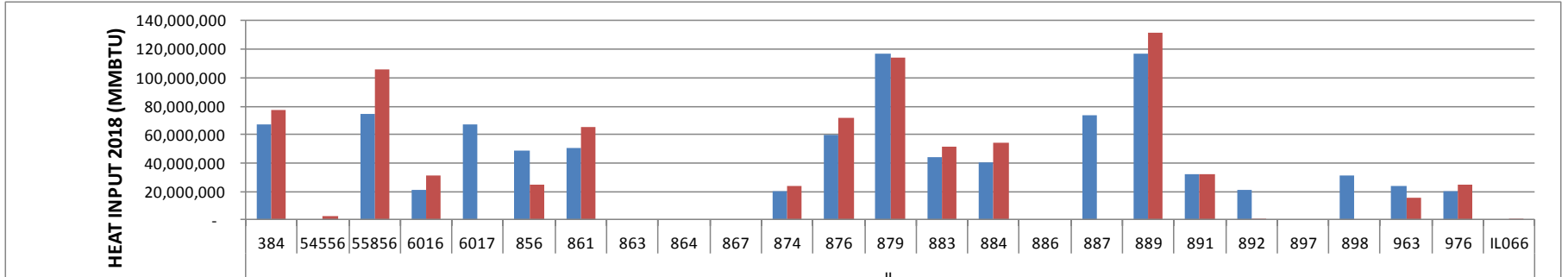
2018 PA Coal – HI, SO2 & NOX

ERTAC EGU2.0 versus IPM5.13



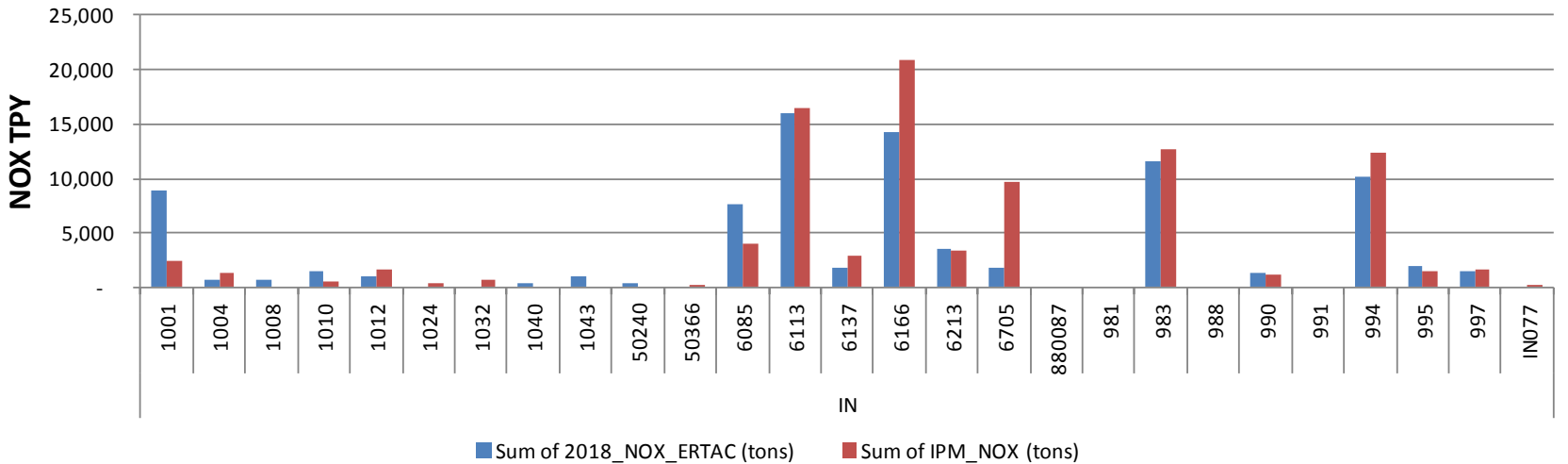
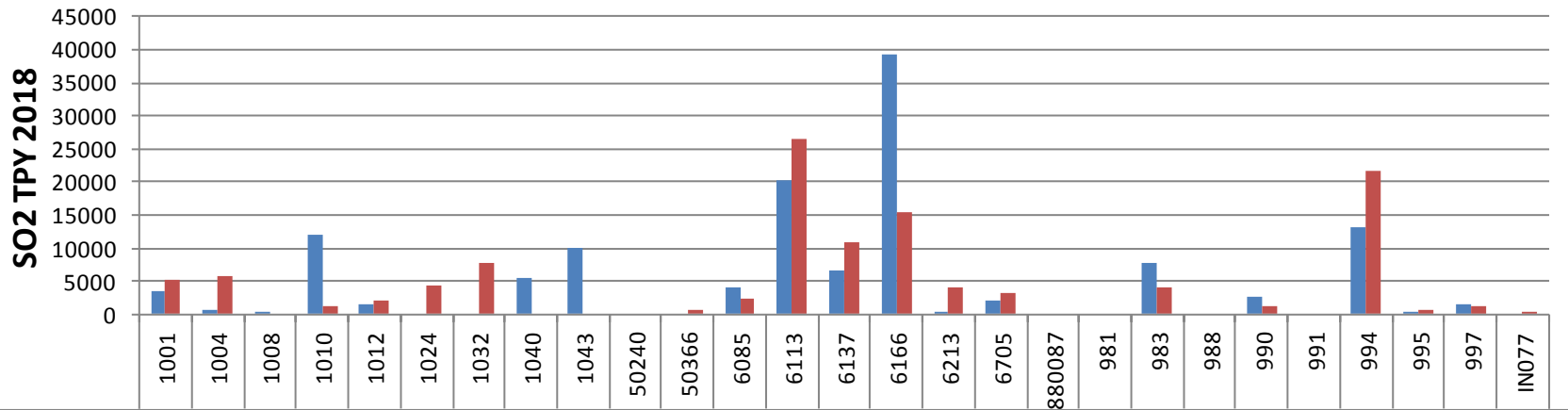
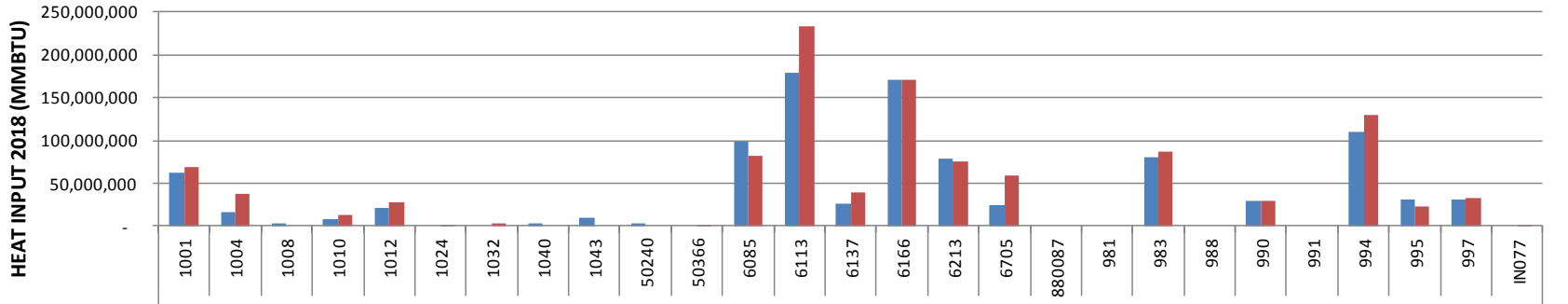
Sum of 2018_NOX_ERTAC (tons) Sum of IPM_NOX (tons)

2018 IL Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13



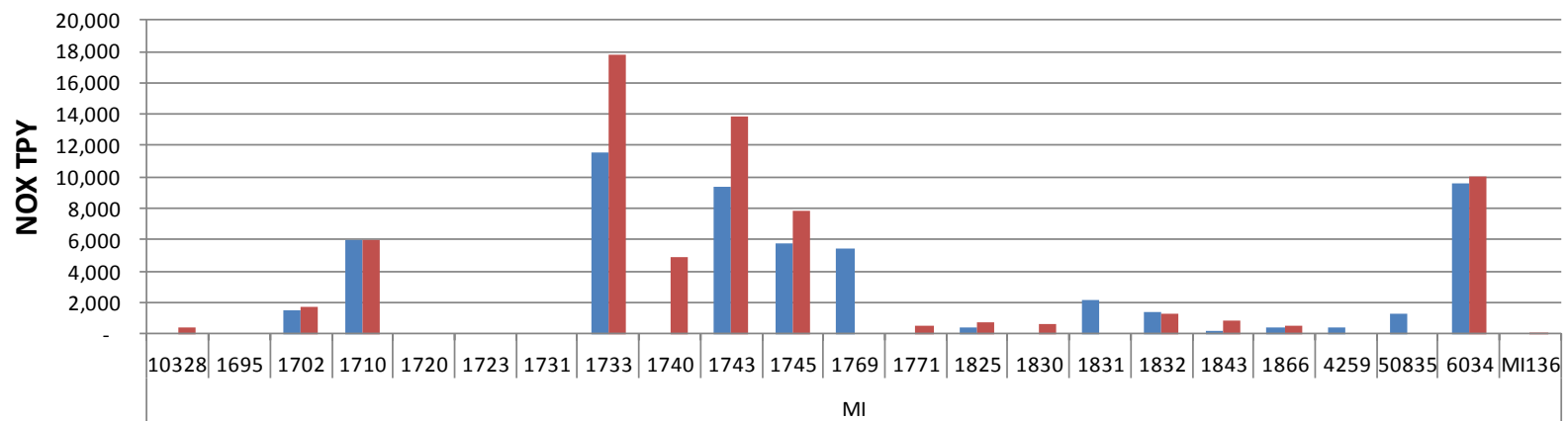
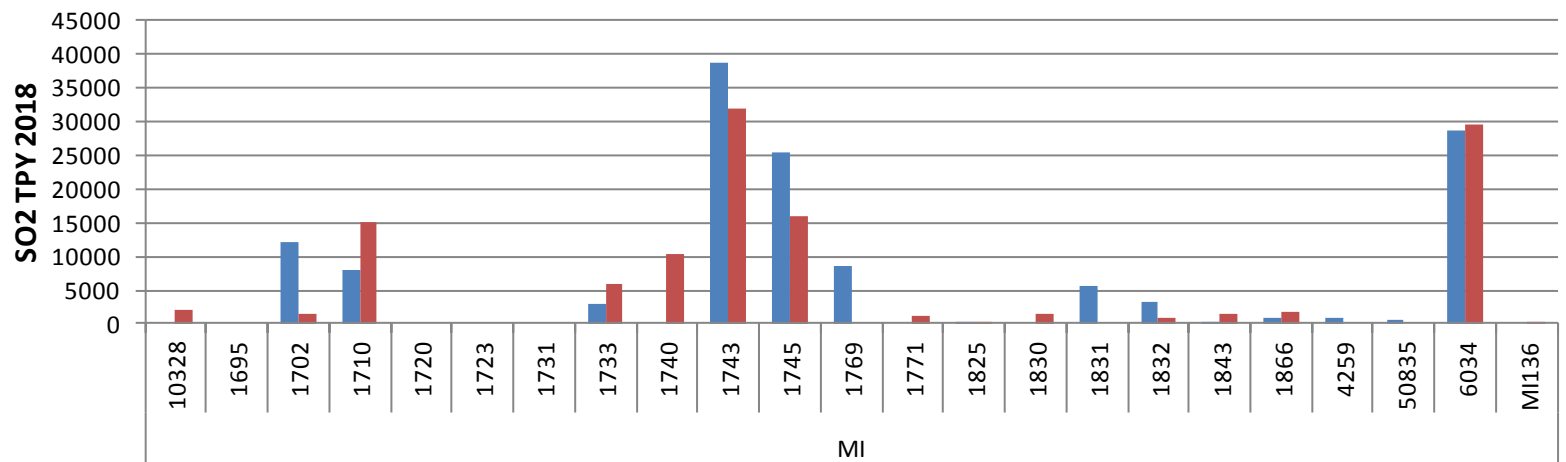
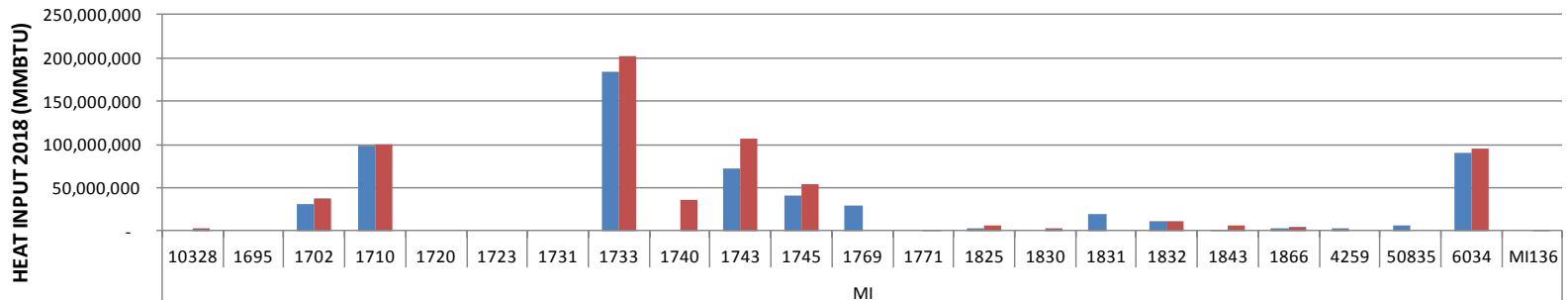
■ Sum of 2018_NOX_ERTAC (tons)
 ■ Sum of IPM_NOX (tons)

2018 IN Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13



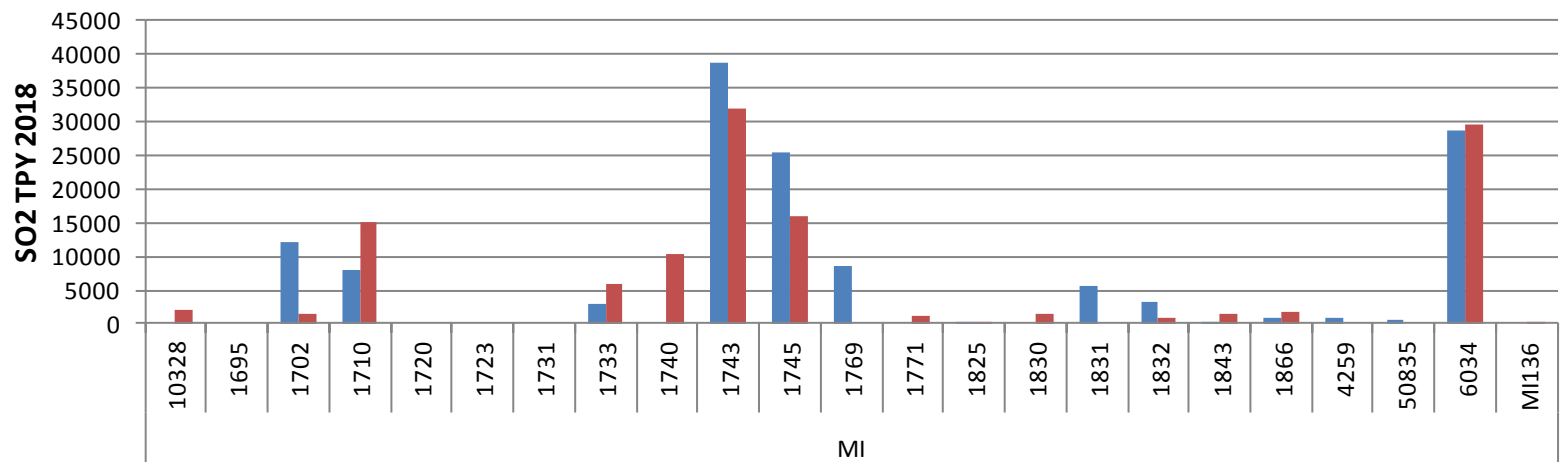
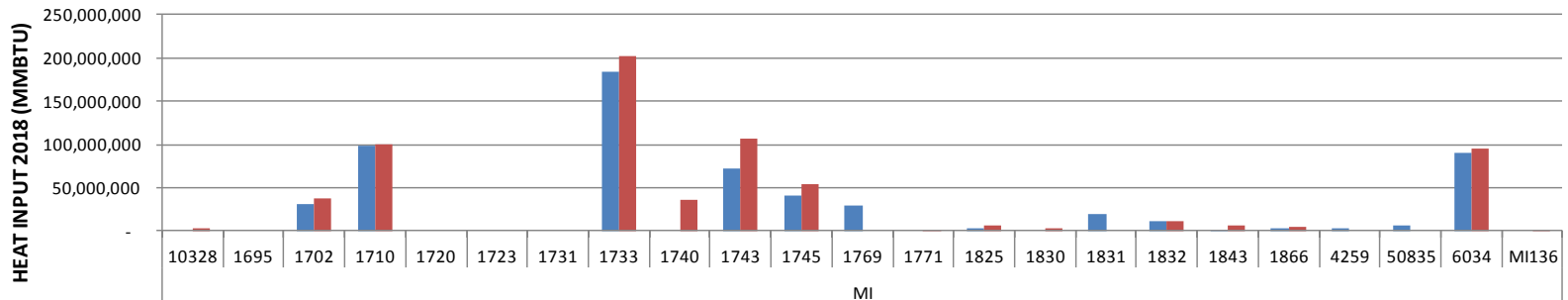
■ Sum of 2018_NOX_ERTAC (tons) ■ Sum of IPM_NOX (tons)

2018 MI Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13



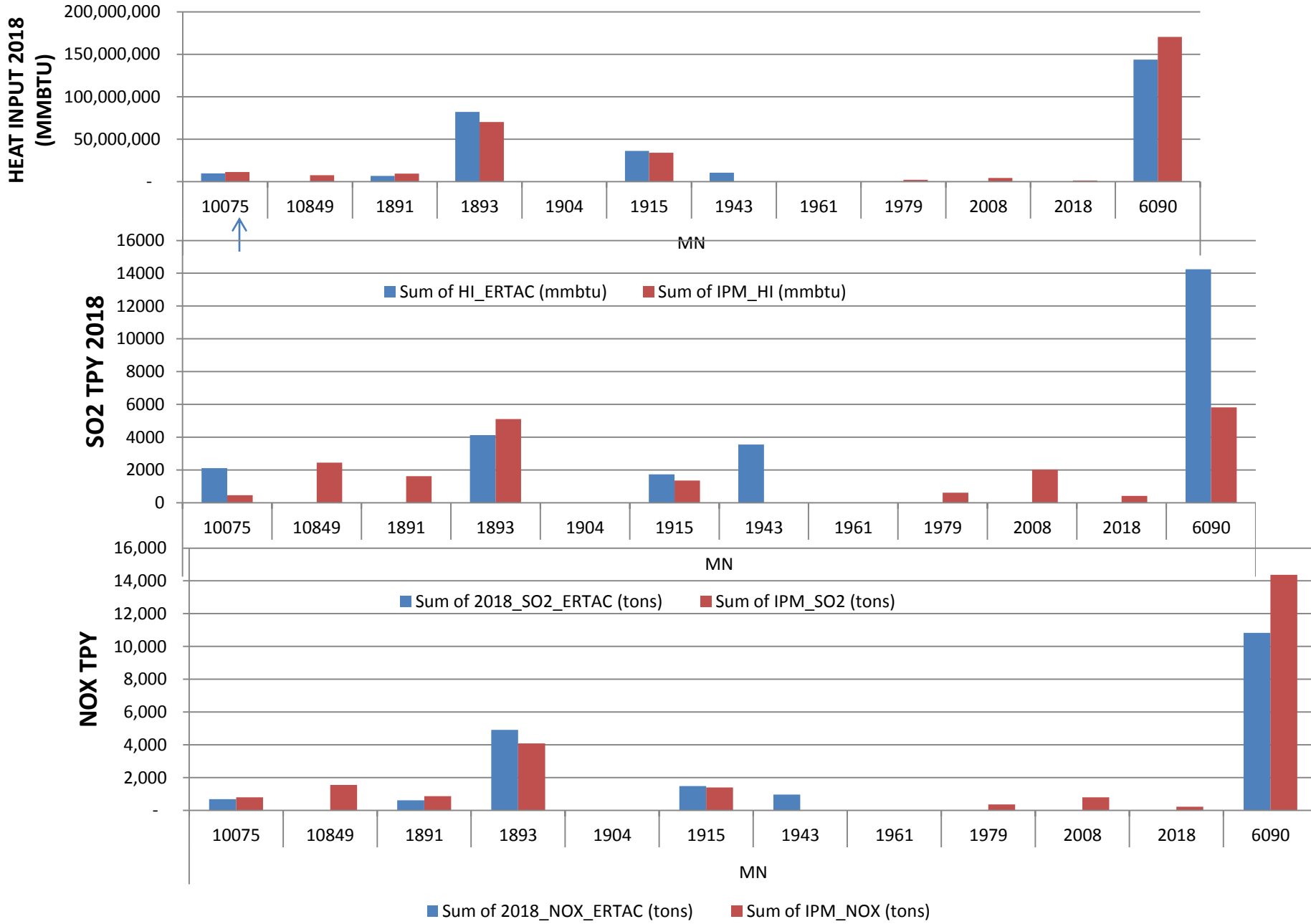
■ Sum of 2018_NOX_ERTAC (tons) ■ Sum of IPM_NOX (tons)

2018 MI Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13

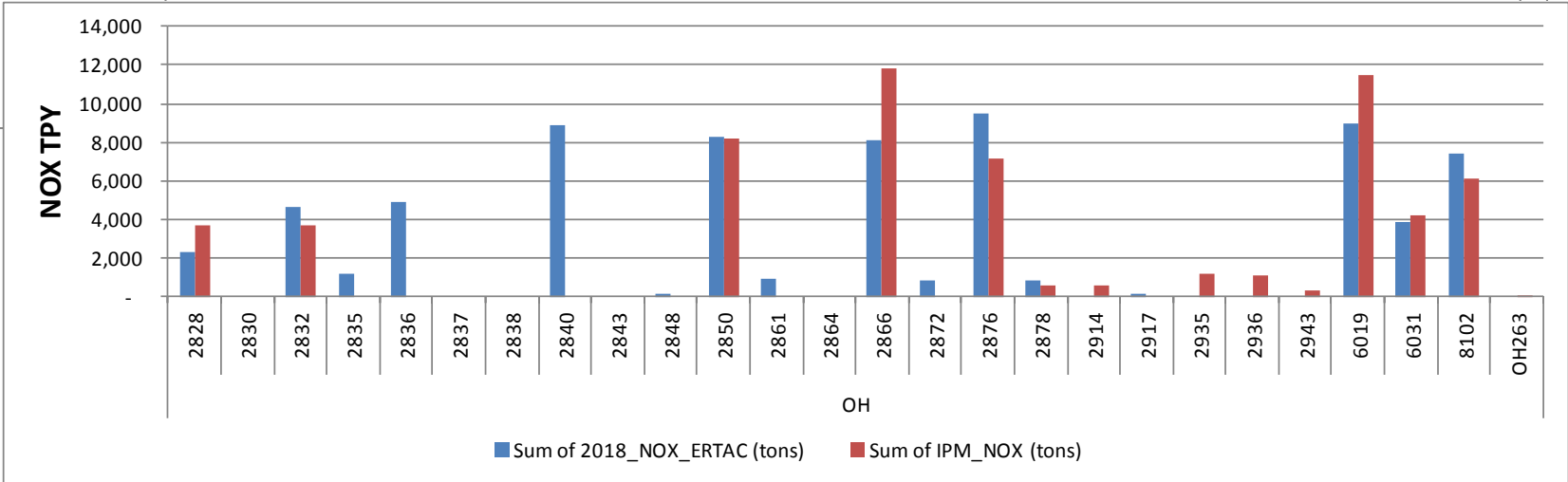
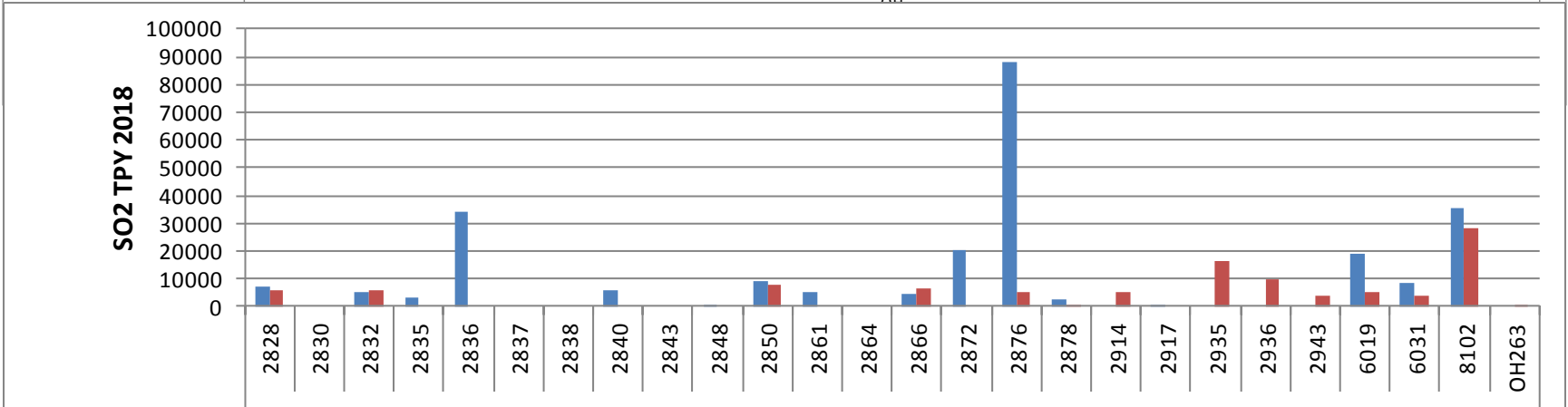
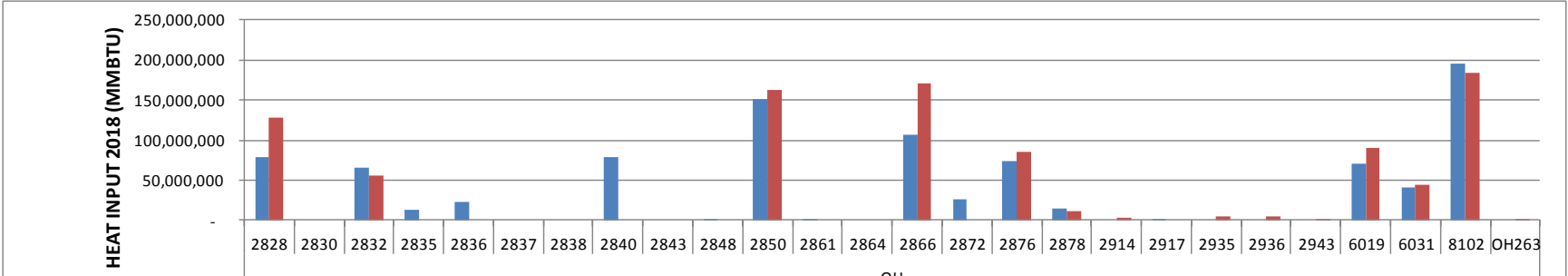


■ Sum of 2018_NOX_ERTAC (tons) ■ Sum of IPM_NOX (tons)

2018 MN Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13

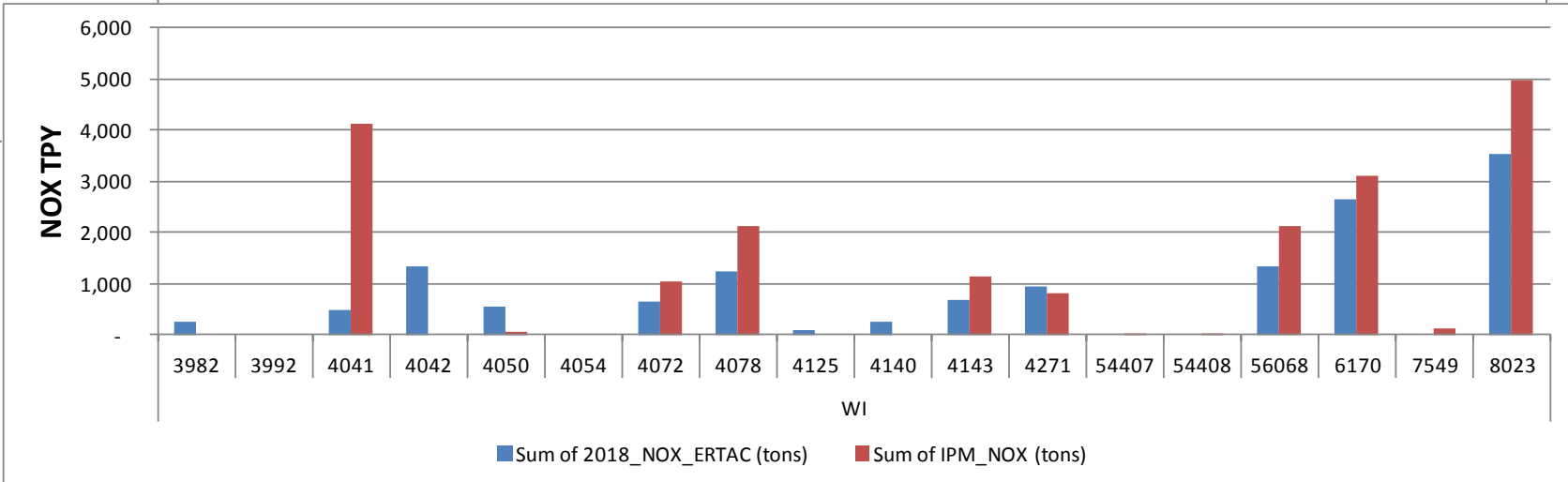
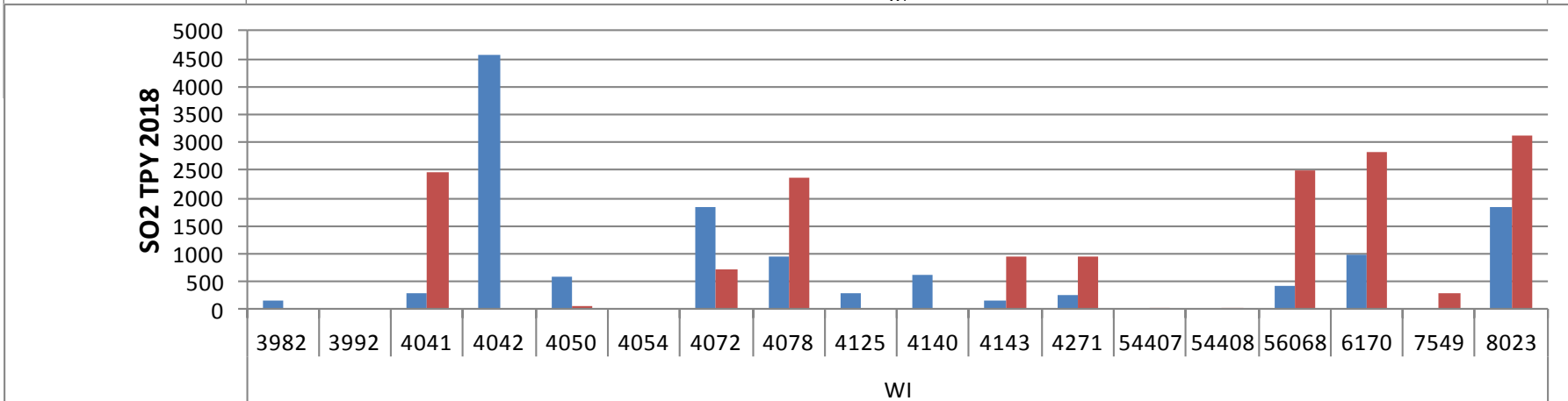
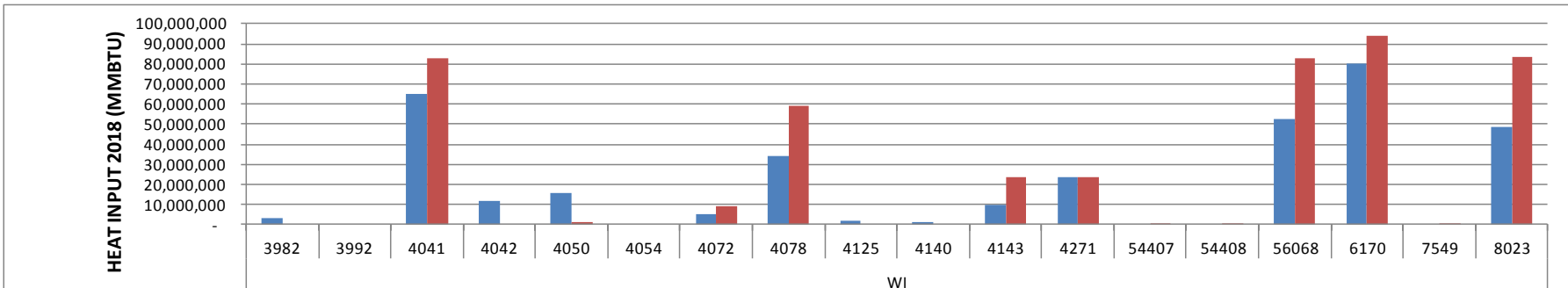


2018 OH Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13



■ Sum of 2018_NOX_ERTAC (tons)
 ■ Sum of IPM_NOX (tons)

2018 WI Coal – HI, SO2 & NOX ERTAC EGU2.0 versus IPM5.13



Sum of 2018_NOX_ERTAC (tons) Sum of IPM_NOX (tons)

ERTAC Summary

- The second version of the model complete.
- Model is running well and results are stable.
- Version 2.1 results moving from “Proof of Concept” to “policy relevant”.
- States conducted thorough QA of model inputs, including permitted new units, shut-downs, and future controls; QA efforts are on-going.
- 7 States and MJOs currently running the model with consistent results.

Next Steps for ERTAC

- Model is a work in progress.
- Continued priorities:
 - ERTAC team: ensuring that inputs and model algorithms are reasonable.
 - State staff review: ensuring that results are reasonable given inputs
 - Provide tools for States to comment on EPA NODA.
- Issues that may require additional resources:
 - Selection of controls currently requires manual inputs (Should model be expanded to select future controls?)
 - Inclusion of GHG emissions
 - Providing continued support, documentation, and training to other states and stakeholders.
- Documentation at ertac.us/egu