

# Condensing Boiler Optimization in Commercial Buildings



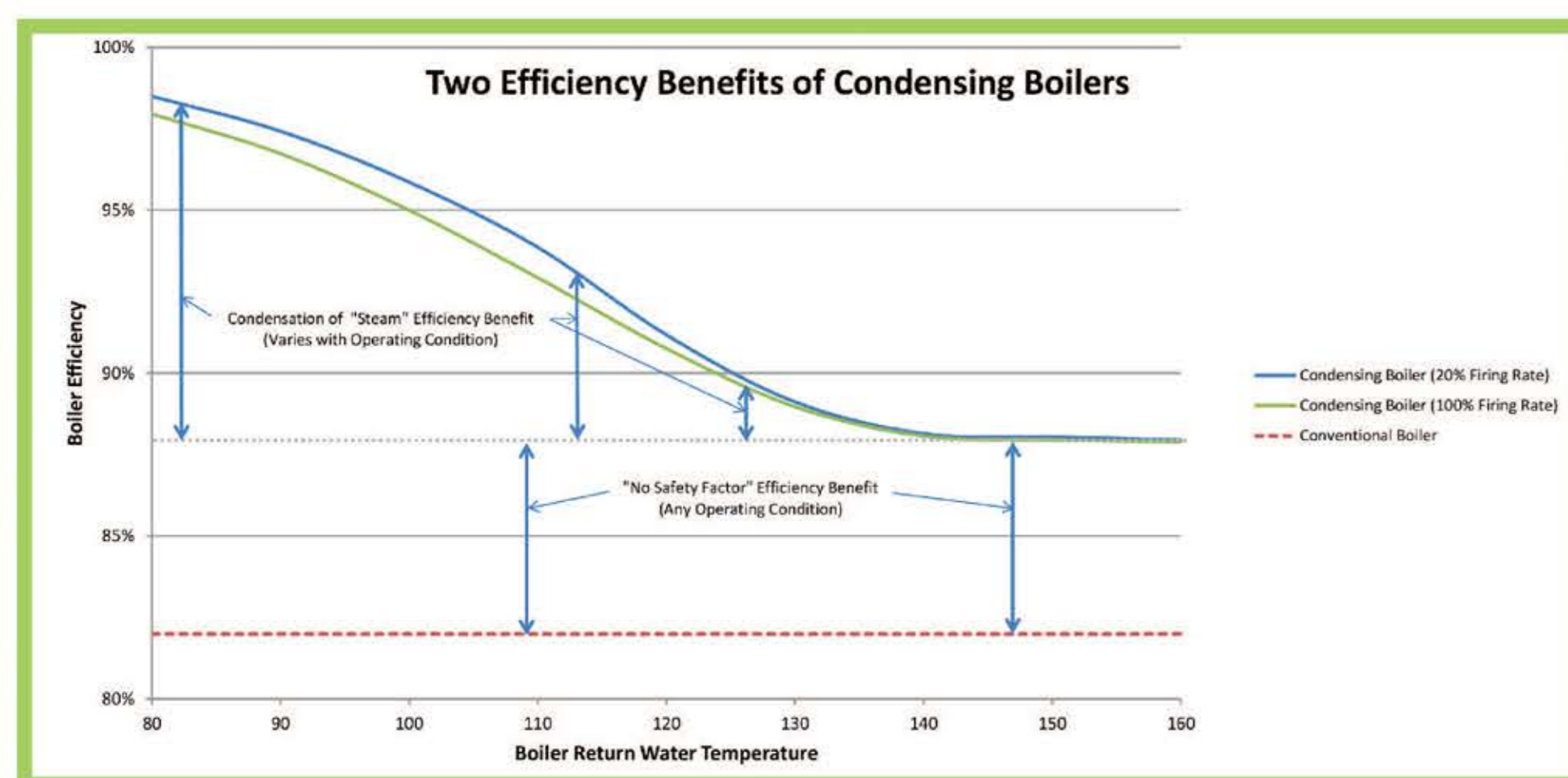
As the installation of commercial condensing boilers has become very common, so has anecdotal information about them being installed and operated in circumstances where do not achieve anywhere near their rated efficiency. This study set out to systematically quantify the impact of real-world installation conditions on the efficiency of commercial condensing boilers installed in Minnesota. We are also developing recommendations for CIP program initiatives that could better optimize their efficiency.

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## BACKGROUND

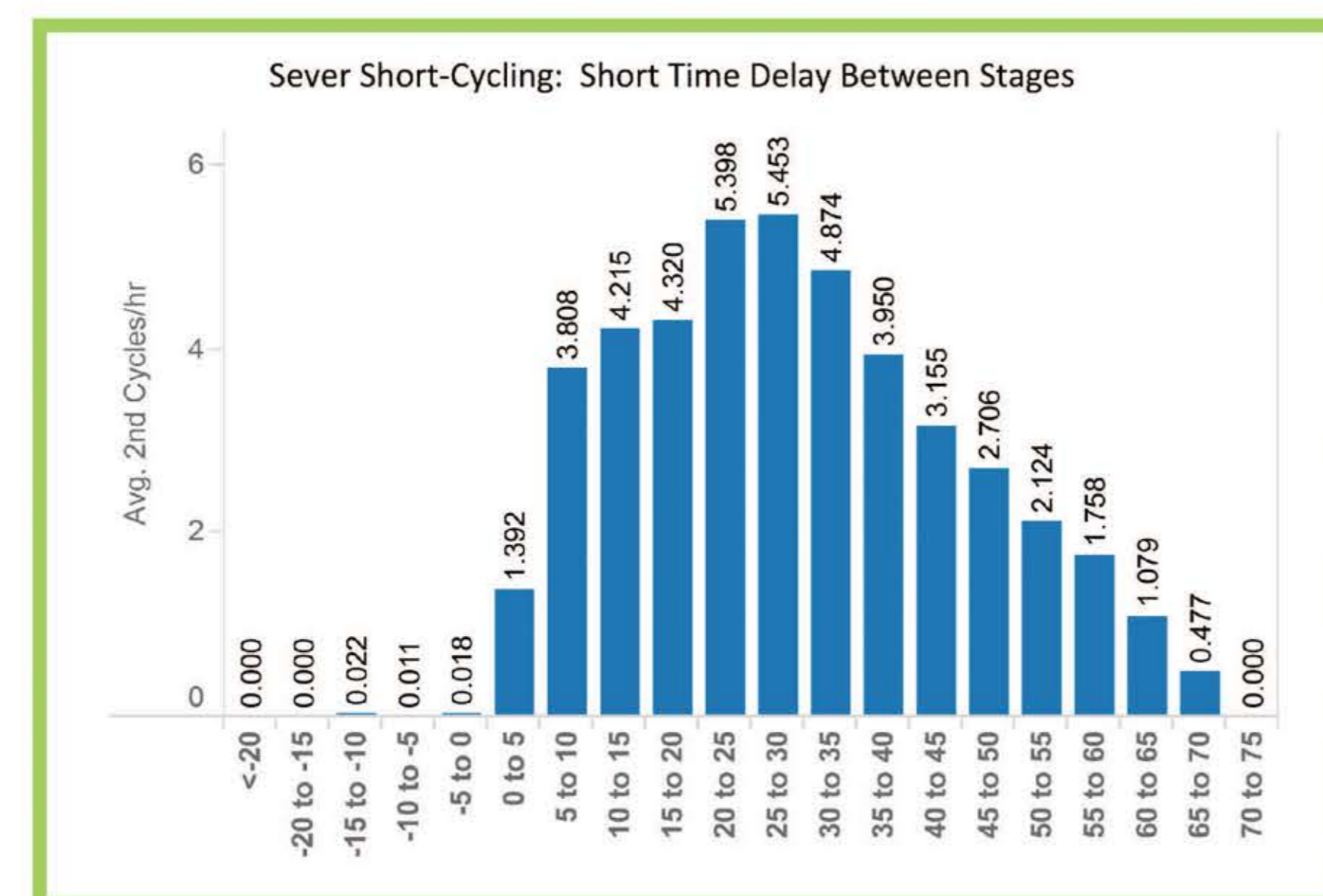
- The main efficiency advantage of condensing boilers is that they condense much of the "steam" (water vapor) that otherwise goes out the chimney.
- Condensing only occurs when boiler water temperatures are lower (<130°F) than what is used with conventional boilers.
- Condensing boiler efficiency ratings are reported for a boiler temperature that is far below what is seen in most buildings.
- Even when they don't condense, condensing boilers are a few percentage points more efficient than other boilers due to the design not needing safety factors to avoid condensation.



## FINDINGS

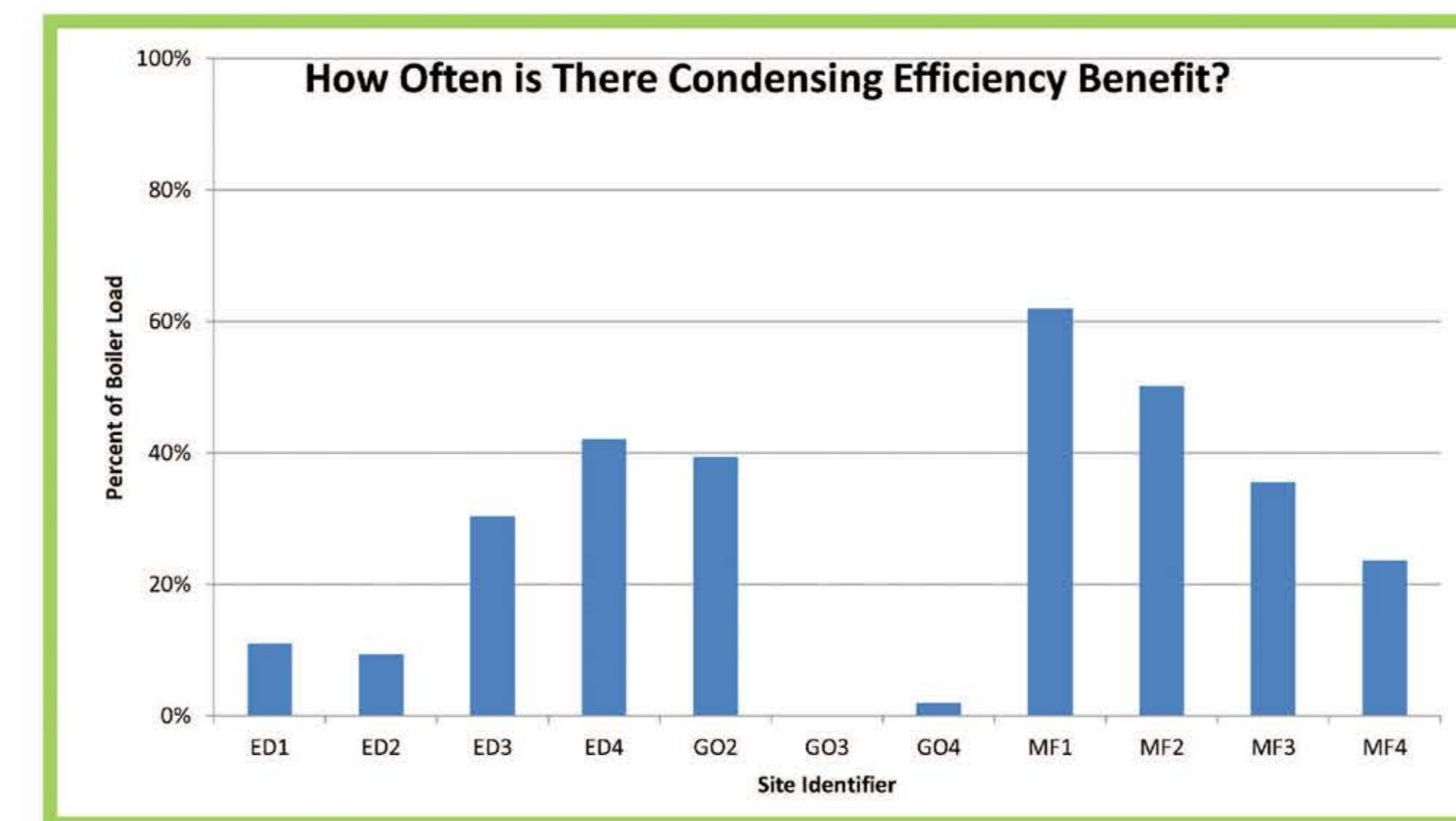
Condensing efficiency benefit achieved for a varying percentage of the heating season

- Boiler water temperature reduction is often limited by existing heating system (e.g radiators, air handler heating coils, service water heating).
- Outdoor reset control settings not optimized.



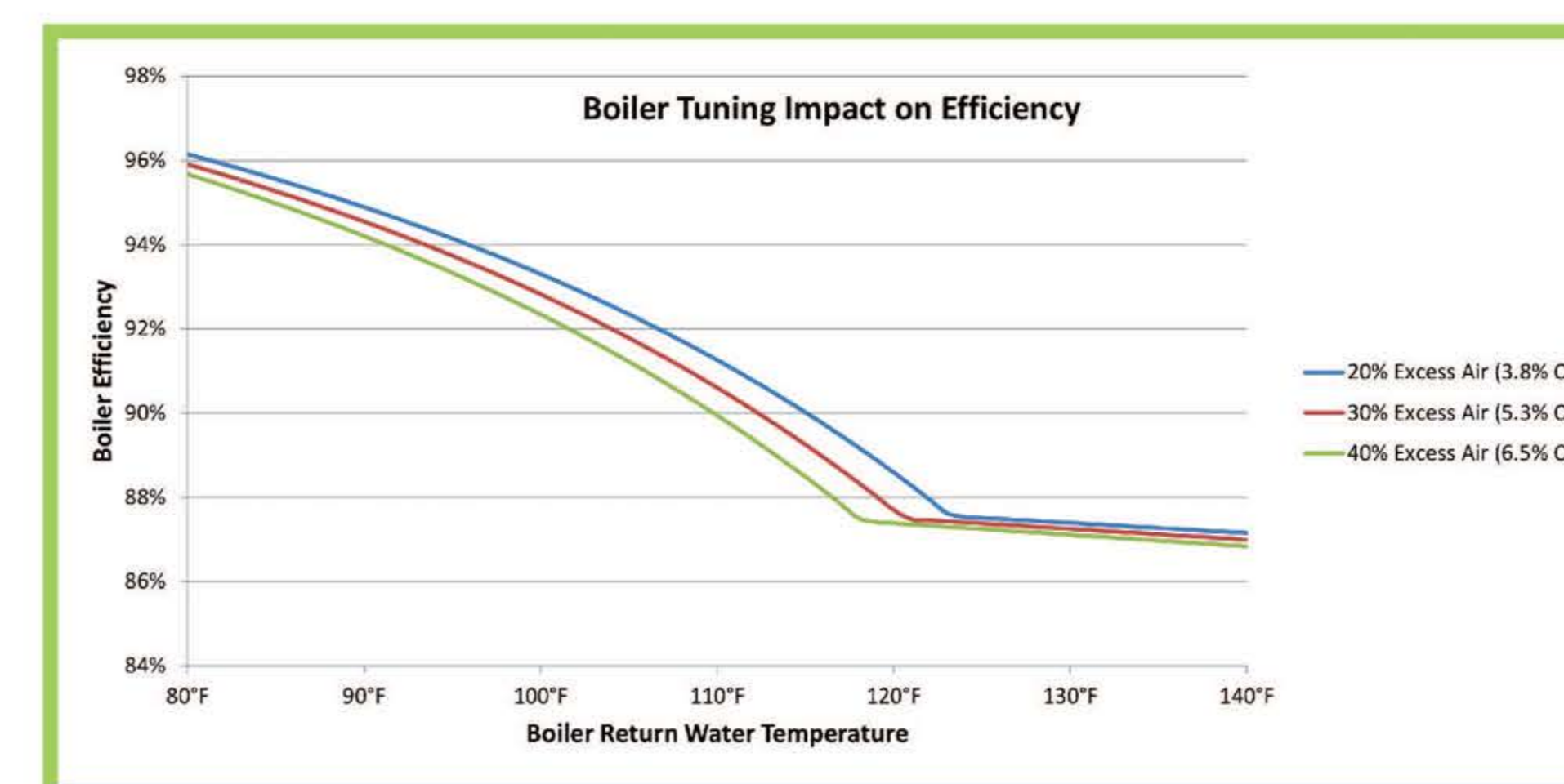
Traditional tuning is more critical than in conventional boilers

- Extra air flow through boiler dilutes the "steam" and lowers its condensing temperature.
- Excess air can vary with boiler firing rate (percentage load).



Efficiency is often impacted by short cycling

- Poor control coordination between built in boiler controls and BAS.
- Sub-optimal settings of boiler controls.



## METHOD

- Monitor boiler operating conditions in 12 buildings across 3 building types (education, office or government, multifamily).
- Calculate impact of operating conditions on annual average efficiency.
- Calculate savings possible with achievable changes to operating conditions.
- Survey local industry professionals about optimization barriers and opportunities.

## CONCLUSION

- There are a number of opportunities to increase the efficiency of condensing boilers in Minnesota commercial buildings.
- Recommendations will address boiler replacement in buildings with conventional boilers.
- Recommendations will address optimization of buildings that have already had condensing boilers installed.