



Seattle
506 Second Avenue Suite 700
Seattle, Washington 98104
206.622.3321

Baltimore
4709 Harford Road
Baltimore, Maryland 21214
410.929.6894

Spokane
505 West Riverside Ave. Suite 440
Spokane, Washington 99201
509.215.1500

February 4, 2022

Delegate Korman
Appropriations Committee
210 Lowe House Office Building
6 Bladen St
Annapolis, MD 21401

Subject: **HB0365 Testimony and Support for FSi Engineers**

Dear Delegate Korman and the members of the Committee,

Thank you for the opportunity to provide you with my testimony in support of the House Bill 0365 for the fossil fuel based energy system cost prohibition.

I am a past Chair of the Board for the Maryland Chapter of the US Green Building Council, Chair of the AIA Baltimore Committee on the Environment, and I have long attended the Maryland Green Building Council meetings that are open to the public. I am a Principal at FSi, with 37 employees—we are mechanical engineers with a strong focus on high performance and net zero buildings, including schools.

House Bill 0365 is a fantastic start at the electric future we need in ALL buildings to address climate change. The systems we install in new schools will last 25-30 years before replacement, and continuing to install fossil fuel based systems will not allow the state to meet its current targets, let alone the more aggressive targets set forth in other legislation in session. Future fossil fuel rates are expected to grow exponentially in the next 25 years as the cost of maintaining infrastructure falls to fewer and fewer customers, with a “tipping point” sometime in the mid 2030’s where gas costs more than electric, even without taking into account heat pumps. (according to the Rocky Mountain Institute).

I appreciate that the bill is not specific on technology, there are many ways in which schools can electrify their HVAC and domestic water heating and a focus on any one technology (like ground source (GSHP) or variable refrigerant flow (VRF)) would be a mistake.

I am concerned that this bill will face testimony that is misguided. Such as:

- You’ll hear claims that heat pump technology can’t work in low temperatures. There are multiple brands of VRF that work at full capacity to below the worst design temperatures in our state.
- You’ll hear that heat pumps cost too much. When a school can fully omit the cost of a gas service, the small incremental cost of using heat pumps often breaks even, and several of our recent projects have saved money omitting the gas service. Additionally,

using heat pumps, the utility costs are essentially the same between an 80% efficient boiler and a heat pump. Add in thoughtful design for optimizing envelope and lighting systems and all electric schools are easily set to meet the more stringent codes coming in the next decade.

- You'll hear that the electric grid is currently emitting more carbon than natural gas and electric schools are worse. Electric schools are a win for carbon emissions, anyone claiming otherwise misses the key point that heat pumps are ~4x more efficient than gas boilers, and that our grid is set to rapidly decarbonize in the next decade.
- You'll hear that the grid can't handle the additional load of electric buildings, but PEPCO released a recent report showing the grid only needed to grow by 1.4-1.7% a year to handle all buildings AND all transportation, well below the peak ~10% growth of the mid 20th century.

I am also concerned that the existing building provisions do not include any cost test or feasibility study to allow for maintaining existing fossil fuel infrastructure in a limited set of circumstances. In some cases, such as steam boilers, there is no direct replacement short of using electric resistance and that technology would require a substantial electrical upgrade for most buildings and would also saddle the grid with very large peak loads in the winter. The alternative to replacing just the boiler in a steam system is replacing the complete system at a significant cost. I believe you should either allow schools to prove out costs for maintaining fossil fuel on a 50 year life cycle cost (LCCA) basis, or provide additional funding for existing schools that need to fuel switch to meet this new electrification requirement. If you use the 50 year LCCA basis, I suggest you require a minimum escalation rate of 1.5% for electric and 4% for natural gas, in line with the study recently released by the Maryland Commission on Climate Change, see appendixes:

(<https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Pages/MCCCReports.aspx>)

Without making those provisions for existing buildings, you're making an incentive structure forcing districts to keep old and very inefficient boilers in existing schools.

I do have a few suggested friendly amendments:

- I believe that all projects should start with a requirement to build highly efficient buildings. This keeps costs down on future solar arrays, operating costs low, and requires a "whole systems" approach to the design, leading to a better design overall. I strongly suggest that the bill include the requirement that new schools follow the Advanced Energy Design Guide for achieving net zero for K-12 schools from ASHRAE: (<https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download>), or that the bill set required energy targets, stepping towards net zero, similar to the



2021 version of the Climate Solutions Now Act. Alternately, you could require adoption of the Appendix Z of the IECC by the MD Codes Administration, less the solar panel requirement, to have zero energy ready schools (DC adoption is here: https://up.codes/viewer/district-of-columbia/ashrae-90.1-2013/chapter/new_normative_appendix_z_/appendix-z-net-zero-energy-compliance-path#new_normative_appendix_z_)

- In 5-325 A.1 (B.1 in bill), you require the baseline comparison to be a fossil fuel based system. This method is how you'll choose any new system, and you require new systems to be electric. It would make more sense to require the baseline is a code minimum electric system. The International Energy Conservation Code (IECC) already has a baseline electric system based on building size in C407. It would be an easy reference to make that the baseline to compare against and reference the most recent adopted version by the state, which would also increase the baseline difficulty over time in step with code increases.
- I suggest that these 50 year Life Cycle Cost Analysis (LCCA) are reviewed outside of the Interagency Commission (IAC), possibly by a third party engineer, and are required to be produced after the Schematic Design Phase of a project. I've seen 50 year LCCA on past projects we've commissioned, and they're hard to believe. These studies often conducted before there is any set building geometry, which naturally impacts the result—in other words, they're conducted so early in the design, the results have no basis in reality and no chance to positively impact system selection for minimal total life cycle cost.

I look forward to seeing your support an ultimately the passage of this bill.

FSi Engineers

A handwritten signature in blue ink, appearing to read 'Ben Roush', is positioned below the company name.

Ben Roush, PE, FPE, LEED AP BD+C,

ASHRAE BEMP and BEAP, Certified Commissioning Professional

Principal