MARYLAND COMMUNITY COLLEGE FACILITIES PLANNERS COUNCIL

December 13, 2024
MEETING MINUTES

Attendees at Anne Arundel Community College

Name	College / Agency
Lisa Aughenbaugh	Carroll Community College
Clarence Bryant	Prince George's Community College
Andrew Clark	Allegany Community College
Miriam Collins (remote)	Chesapeake College
Steve Dyott (remote)	Chesapeake College
Laura Dyson (remote)	Chesapeake College
Gregory Grey	Wor-Wic Community College
Tony Hinton (remote)	Hartford Community College

Name	College / Agency
Christina Kilduff	Allegheny College
Dong-Min Kim (remote)	Montgomery College
David Koenigshurg (Remote)	DBM
Jason Ludd (remote)	Cecil College
Chris Painter	Garrett College
Dan Schuster	MHEC
Iman Shaker	DGS
James Taylor	Anne Arundel Community College

Officer Reports

- Chair – Chris Painter

- Vice Chair - Greg Grey
  - Climate Solutions Now – Several people attended the Climate Solutions Now Event webinar/seminar and found it helpful for completing the Energy Star Portfolio Manager. We also received information from a reputable company that can assist with inputting the data into the system. While we have someone to enter the information, it's a lot of reading to fully understand what needs to be entered in order to generate the desired results. If we're unable to figure it out quickly, we're leaning towards using this company for assistance. Maryland is expected to require calendar year 2024 data submission by June 2025.

- Secretary – Dong-Min Kim
  - Nothing to report

- Communications Coordinator – Travis Hopkins

- The rate of changes and additions to the list has slowed down a bit. I believe we had just one or two updates last month. I will update the membership list and send it out to everyone. Please let me know if there are any changes.

❖ Best Practice– Jim Taylor
- Today, we have the Energy Star Portfolio Manager presentation. Currently, there is no presentation scheduled for the January meeting in Chesapeake. We need to decide what kind of discussion or presentation we'd like to have. Some options to consider include: 1) CM at Risk, 2) Procurement Methods and Purchasing Agreements, or 3) PEPCO Rebates/Clear Results. Additionally, during the retreat, we could have a session focused on sharing processes and information on how large, medium, and small colleges handle work orders.

❖ Best Practice - John Anzinger (Absent)

Agency Reports

❖ DBM – David Koenigshurg
- DBM does not have any major updates. We are just doing the budget process and awaiting decisions. If you have any questions about your respective projects, feel free to reach out to Conrad or myself.

❖ DGS – Iman Shaker
- There's not much to say, but we're still doing FY 26 programs right now, and in the queue there's two contract awards for PG College and got a couple from Anne Arundel. We are up to date on close outs and waiting for one college and you guys are doing a great job to make CEP's.

❖ MHEC – Dan Schuster
- First, I sent out the 2025 reference calendar last week, which includes all the key dates and a general schedule of events for your reference. I hope everyone received it. If not, I have a few paper copies here, or feel free to email me, and I'll send it to you directly.
- We briefly touched on the budget, but just to clarify the next steps: The budget will be released around January 15th, at which point you'll hear from David or Conrad (depending on your analyst) to confirm whether your project is included in the budget. After that, the Assembly will hold their hearings. Once the dates are confirmed, we'll let you know. Attendance at the hearings is generally not required unless you need to respond to questions from DLS, but don't worry—you won't need to answer them unless necessary. The budget will be adopted in April.
- As for upcoming submissions: the second-quarter reports are due by January 31st. I hope everyone is working on any updates to their facility master plans. If there have been any changes over the past year, please submit those updates. If there are no changes, you can simply submit a letter confirming that. These annual reports are due by February 1st, but since that falls on a weekend, I'll extend the deadline to February 3rd this year.
- Looking ahead, FY28 new projects are due by March 1st. If you've listed new projects in your CIP, I'll reach out next month to confirm that you're planning to submit them on time. You'll be hearing from me about that in the next few weeks.

MACC – Monica Randall (Not present)
- The Cyber Workforce Accelerator (CWA) program is progressing well and is on schedule. Our partners at BCR Cyber have completed updates to the baseline system and server installations. This month, we're focusing on Community College infrastructure development, which has been underway with installations scheduled throughout December and January. They've nearly finished procuring and delivering equipment to the Community Colleges, and in the coming weeks, they'll finalize requirements, continue equipment installations and testing, and resolve licensing issues. Additionally,

BCR, Cyber, and MAC held an ACWA status meeting with points of contact from 15 of the 16 Community Colleges. The next update meeting is scheduled for February.

- **FPC FY25 Goals**
  - Goal 1 Identifying and share best practices for facility planners by exchanging individual college practices as well as presentation from industry and state agencies.
  - Goal 2 Continue publishing CIP State Projects on both the MACC and FPC websites.
  - Goal 3 Monitor MACC and to keep the FPC better informed, as the two-week notice for vaping regulations was insufficient.
  - Goal 4 Restructure meetings and broaden our member base to enhance knowledge sharing by annually reviewing the Facilities Manuals, examining the website during meetings, integrating these elements into the meeting structure, and sharing standards and lessons learned from other projects. We will tie these ideas into the agenda and use the meeting location as a physical link by inviting others from the hosting campus for special topics. We are making reasonable progress with that last one, the discussion focused on regular website reviews, informal agenda – setting, and the annual review of the facilities manual, with updates included in report, while the next stops re to define the frequency of website reviews, formalize the agenda – setting progress, and determine the best timing for the facilities manual review.

- Climate Solutions Now and Building Energy Performance Standards (Virtual) Ben Roush, PE-ME, FPE, LEED AP BE+C, CCP, ASHRAE BEMP and BEAP, CEPE Principal FSI Engineers

  - Performance standards are driving the push for building electrification, as the electric grid is expected to become more carbon-neutral. I'll show you some graphs illustrating this. For Maryland, this is particularly important because we have 3,100 miles of coastline. I had to double-check that number myself, and it's mainly due to the numerous inlets on the Eastern Shore. For our size, we actually have more coastline than any other state, which makes sea level rise a significant concern. Maryland is actively working to mitigate its impact.
  - Maryland has consistently ranked in the top tier or just below when it comes to energy codes. Our energy code always aims for the most advanced standards. However, our current energy code doesn't require new buildings or major renovations to be fully electric. This is where building energy performance standards (BEPS) come into play. While it's not mandatory to make all buildings electric, starting in 2030 and ramping up through 2040, there will be significant fines for non-compliance. We'll go over those in more detail, particularly for buildings over 35,000 square feet, which will be relevant for campus planning.
  - It's also worth noting that Maryland contributes 0.1% of the world's CO2 emissions. While this might seem like a small number, when you consider our population size, it's a substantial amount of emissions. I initially didn't believe that figure when I first heard it, but it's accurate.
  - Additionally, the building energy performance standards include a pathway where you can pay a carbon fine. This adds about a dollar to the cost of a therm of gas—currently priced at $1.70 per therm, so it essentially doubles the cost of gas.
  - I received an email this morning confirming that the Maryland Department of the Environment (MDE) has finalized this program, and it will go into effect in December. We'll also discuss some of the legislative challenges and changes from the last session. I'd also like to touch on what other local jurisdictions are doing, because understanding their frameworks is important. For example, DC has already implemented a building energy performance standard and is a few years ahead of us.

- In Maryland, the first major target is set for 2030, while DC's first real target is 2026, though it can be postponed to 2027 for high-energy-consuming buildings. Both are aiming for carbon neutrality, but Maryland is targeting 2040, while DC is aiming for 2050. For the electric grid, Maryland has set a target of 2045.
- They use the Energy Star score for their building performance standards. With Energy Star Portfolio Manager, you get an Energy Star score, which is interesting because, while it's technical, it doesn't necessarily incentivize heat pumps as much as some other methods that could have been chosen.
- Montgomery County is implementing its own building standards for buildings over 20,000 square feet. So, if any of your community colleges are located in Montgomery County, you'll have a lower threshold for compliance. Even if you don't reach the 35,000 square foot mark, you may still need to meet some reporting requirements and make adjustments. Montgomery County is focusing on Energy Use Intensity (EUI), which measures energy use per square foot per year. This helps normalize and compare buildings. We'll talk about EUI in more detail as we go on.
- While it's not completely finalized, I understand the proposal was up for a committee vote. I haven't checked the latest updates on that yet. Nationwide, various locations are starting to implement building energy performance standards. My firm, which is mostly based on the West Coast, is already dealing with these, and along the East Coast, from New York to Maryland, there are similar standards being rolled out.
- It's important to note that building energy performance standards are not a ban on gas use. Fossil fuels are still allowed, but using them will come with additional fees. Some states have tried to ban gas, while others have passed legislation preventing such bans. If you look at the map, you'll notice the colors resemble a political map, highlighting the political aspect of this issue. We'll see how things evolve in the next few years as more states adopt these standards.
- The legal challenges surrounding building energy performance standards will make for an interesting few years. In DC, there was an attempt to transition entirely off fossil fuels and power buildings with local renewables, but it didn't pass. While it didn't succeed, the local grid did issue a report stating that to make this happen, the grid would only need to grow by 1.8% annually over the next decade. So, it wasn't really a significant challenge in the grand scheme.
- DC also has an Appendix ZA, which focuses on zero energy buildings and uses a unique score, but it's similar to what Montgomery County is doing in their most recent energy code. If anyone here is from Montgomery County, we can discuss this further during the Q&A session at the end.
- Now, let's dive into the carbon aspect and why it matters. The building energy performance standards are allowing electric usage but restricting fossil fuels. Here are some conversion factors from the International Green Construction Code (IGCC) for equivalencies. If you use electric, in terms of therms, it's 20.5 lbs of CO_2 per therm. This is actually higher than natural gas. On the other hand, if you look at gas in kilowatt-hours, it's 0.4 lbs of CO_2 per kWh.
- Although natural gas currently produces less carbon than electricity, this doesn't account for efficiency differences. To make the comparison simpler, I've converted everything to pounds per megawatt-hour (MWh). I adjusted the figures for our particular grid, which is in the 716 regions, as opposed to the IGCC, which uses the grid in Michigan (known for having the worst electric grid in terms of carbon emissions). As someone originally from Ohio, I like to point out Michigan's challenges—it's a bit of an Ohio State rivalry thing!
- A significant portion of our carbon emissions comes during peak periods when we draw power from RFC W through the interconnect, as they primarily rely on coal power. You can verify this using the EPA Power Profiler. Based on the data, we're currently at 672 for this year, down from 716. So, while we're seeing a decrease in carbon emissions over time, aligning with the state's goal of achieving a carbon-neutral grid by 2045, this doesn't mean we're carbon-free. It doesn't imply we've stopped burning coal or natural gas; rather, it means we're offsetting any carbon emissions in the grid, making us carbon neutral. This reflects a 6% year-over-year improvement, which is noteworthy.

- Here’s the graph I promised—sorry, you can’t see my cursor, but I’ll use colors to highlight the key points. Starting from 2020, if you look at the blue line, which represents electric power, it drops to zero by 2045. The yellow line represents natural gas, which stays level indefinitely. You might think that natural gas is cleaner than electricity, and that’s true for 2020 and will remain true until around 2025, assuming the electric grid continues on its projected path. This doesn’t take into account any efficiency improvements.
- The orange line represents an 80% efficient boiler, while the red line shows a 96% efficient condensing boiler, the most efficient natural gas equipment available. However, these boilers lose efficiency over time. By year 25 (or 2045 in this case), they would need to be replaced to maintain peak efficiency. As they age, they continue emitting carbon. In contrast, electric resistance heating is 100% efficient, meaning it doesn't lose efficiency over time. If you follow the blue line, as the grid becomes less carbon-intensive, your building’s carbon footprint decreases as well.
- But the real standout is the thick green line—representing heat pumps, which are 3 to 4 times more efficient than the best natural gas products in terms of energy use. Heat pumps start with a much lower carbon footprint and continue to decrease as the grid gets cleaner. By 2025, they’ll reach zero emissions, aligning with the grid’s carbon-neutral goal. This is why "Climate Solutions Now" is urging us to electrify our buildings. If you continue using fossil fuels, there may be an alternate compliance path or a penalty in the future due to the emissions they generate. That's a lot of information in a small space, but it's all pretty simple.
- The Climate Solutions Now initiative had a major push in 2022. It failed to pass in 2021 and parts of it didn’t pass in 2020. It was a multi-year effort with many groups both for and against it, and there were several hearings. I testified as part of AIA Maryland, the American Institute of Architects, where I’m on their legislative committee. I specifically spoke about the feasibility of heat pumps in cold temperatures, as they now work excellently in those conditions, blowing hot air. If we get the chance, we can dive deeper into that later.
- There were several things that passed, many of which may affect your colleges beyond just the building portion. For example, the electric school bus initiative could be something to consider.
- What didn’t pass? Originally, the proposal targeted buildings over 25,000 square feet, requiring all new buildings to be electrified. This would have made it mandatory under the energy code to build new buildings with full electrification. Currently, we can still build non-electric buildings above 35,000 square feet, but by 2030, those using gas will face fines for their emissions. It’s a bit of an odd situation, but that’s where we are.
- The rules for commercial and residential buildings over 35,000 square feet are that, by 2025, you'll need to report your 2024 energy use for your campus or buildings if they have building meters. There are a few ways to report this; if your entire campus is metered, you can report on a campus-wide basis. The goal is to reduce energy use by 20% by 2030 based on the 2024 benchmark, specifically focusing on gas usage and direct emissions—so, what’s being used on-site, including from gas meters, oil deliveries, and in a few cases, generators or diesel use, though exemptions for these are rare.
- By 2040, the target is to reduce emissions to zero, or face an alternate compliance fine.
- For reporting, you'll be using Energy Star Portfolio Manager to track and report your building's energy performance. If you're not already familiar with it, it's a free and fairly straightforward tool. You can give others access by sharing an email invite, and they can accept it. That's how you'll share your data with the state as well—through email.
- You have until June to start gathering the data and getting it into the system, but this can be challenging, especially since many campus buildings aren’t individually metered. In that case, you can take a campus-wide approach and consolidate the square footage of relevant buildings. However, without individual building meters, it’s difficult to exempt buildings under 35,000 square feet that don’t meet the standard, so this is something to discuss with your energy manager.

- You'll need to determine what level of detailed data you have for your buildings and which ones are over 35,000 square feet. The assessed value is based on your property tax assessment by building, not necessarily the physical measurements. For example, if your building is listed as 34,900 square feet in the plan view, but the tax assessment says it's 35,001, you'll need to report that building, regardless of its actual size, unless you go through the process of adjusting your tax assessment.
- You will be required to report this data every five years, so while this is a current discussion, it's part of a long-term process. There are some exceptions to what's applicable. For instance, food service facilities like cafeterias can be exempted. You can either deduct gas use per square foot for the kitchen area or, ideally, meter the kitchen separately. We strongly recommend the second option, as the deduction is more accurate, especially if you run a full-time cafeteria that serves meals three times a day.
- Other exemptions include parking garages, historic properties, elementary and secondary schools (though unfortunately not colleges), and energy used for manufacturing processes. If you have technical education facilities with specialized areas, like welding shops, that use energy for training, you may be able to exclude that energy usage, but only if you have sub-metering data to isolate the energy consumption for those specific processes.
- Agricultural buildings are also exempt—if you have a greenhouse on-site and the energy use is metered, you can likely remove that. However, there aren't many greenhouses over 35,000 square feet at the campus level, though places like the Eastern Shore might have larger structures, such as hoop houses.
- As for the buildings that fall under these standards, roughly 4,000 buildings in Maryland are subject to these requirements. Many of the buildings in this group, including those in this room, will likely exceed the 35,000 square-foot threshold. However, compared to the total number of buildings in the state, it's still a relatively modest grouping.
- Here are the standards. Don't get too caught up in the technicalities—these are measurements in kilograms of CO2 per square foot. The conversion is simple: 1 metric ton equals 1,000 kilograms or about 2,200 lbs. For college and university buildings, the target is 2.43 kilograms of CO2 per square foot. Starting in 2035, the interim standard will be 1.21, and by 2040, the target is zero.
- Energy Use Intensity (EUI) is also a factor, and an EUI score of 57 is considered healthy for colleges. However, it may be challenging to meet, given the number of hours your buildings operate. There are different ways to approach reporting. You can either use a campus-wide approach and apply the college line, or you can calculate it for each individual building, normalizing for square footage and then dividing by the total square footage of your campus. It's advisable to do both approaches and have your energy auditor or energy team evaluate which method provides more flexibility with your score.
- EUI targets are set for 2040, but the legislature removed this requirement last year. I'll explain that more in a moment.
- The EUI target essentially limits how inefficient your building's energy use can be if you replace old boilers with electric resistance heating, for example. Again, an EUI of 57 for colleges and universities is good, but it's not the most efficient.
- These targets will be adjusted based on the data submitted for the 2024 reporting period via Energy Star Portfolio Manager. Currently, the data used for Portfolio Manager comes from buildings that are high performers—those aiming for the Energy Star label. So, as more buildings submit their data, these targets may become more lenient.
- Let's talk about the potential penalties. The Maryland Department of the Environment (MDE) isn't referring to these as fines—they're calling them "alternate compliance paths." Essentially, you're allowed to keep your gas, but it comes at a cost.
- Starting in 2030, you'll be charged based on how far you are from the target. The fee is calculated by the net difference between your actual performance and the target. In 2035, if no action is taken, your deduction will shrink and the fee will grow. By 2040, the fee will cover the full value, as the target will be zero for everyone.
- At the campus level, for an average 150,000-square-foot building, you could face annual fees ranging from $30,000 to $50,000 if you're using traditional gas heating (like steam

or natural gas). If you have a high-efficiency condensing gas boiler, the cost may be in the $20,000 range. On a campus-wide level, these fees can quickly add up to low six figures depending on your square footage.

- While the EUI targets are currently on hold, Maryland has delayed setting these targets until after the 2024 benchmarking data is reported in 2025. So, although the EUI targets are officially removed from the standard for now, they will be included once that data is available. This delay pushed back the expected approval of the standards, which was originally scheduled for mid-2024 but was just finalized today.
- If I had my way, I'd push for a more flexible compliance path, like the one in DC or Washington State, that allows for performance-based compliance for low-performing buildings. DC, for example, lets buildings with energy use intensity (EUI) more than 50% above the median target to make gradual improvements. This flexibility allows you to work toward the target over two or three cycles, rather than hitting it all at once. This approach is important because it acknowledges that mechanical upgrades to eliminate natural gas are cyclical—usually happening only once in the lifespan of the equipment, every 20-25 years.
- I'm also concerned about the private market and stranded assets—buildings that can't be fixed and can't be sold. Some argue this could lead to people abandoning buildings. A lot of attention has been given to the case of the California Restaurant Association vs. Berkeley, where Berkeley attempted to ban natural gas piping in buildings. However, building energy performance standards in Maryland are not the same as a gas ban. You still have the option to keep your gas, but you'll need to pay the carbon fee.
- Regarding solar energy, it would have been helpful to include deductions for on-site solar or local renewable energy credits in the EUI target. This would have provided a cost-effective way to lower EUI. However, the Maryland Energy Administration (MEA) didn't include this because their primary concern is balancing a winter-peaking grid. While Maryland currently has a summer-peaking grid, the concern is that by the mid-2030s, the grid could shift to a winter peak. When that happens, solar energy will be less reliable since it doesn't generate power at night during peak demand.
- Now, let's look at some grid growth rates. As part of the Climate Solutions Now Act, a utility study was required through the Public Service Commission to assess the electrical capacity and growth needed to meet the 2030 and 2045 goals. The study revealed that, for the next decade, Maryland's utilities need to increase their capacity by 2.1% per year. This is a small increase compared to historical growth rates, which in the mid-20th century were as high as 8-12% per year. This growth must account for building electrification as well as the electrification of transportation.
- The projections in the Brattle study were based on a high electrification scenario that assumed heat pumps. However, if we were to replace boilers with electric resistance heating, the demand would be three-and-a-half times greater than with heat pumps, particularly during the coldest periods when peak demand occurs. So, it's worth reviewing that Brattle Group study, and there's also an E3 study that explores various electrification scenarios and their potential impact on utility rates. This could provide a financial incentive to electrify buildings, even if the penalties for noncompliance aren't immediate.
- Before we move on, here's a bit of humor—this regulation may have only a few rules for buildings, but they are strictly enforced. The alternate compliance path can have a major financial impact, essentially altering the economics of boiler replacements. For colleges and other institutions, it's crucial to consider how long you'll need to pay into the alternate compliance path, when you'll replace your gas equipment, and what you'll replace it with. These decisions will significantly shift your financial landscape.
- Now, let's dive into the economics. We also need to discuss how utility rates are expected to evolve. As part of the Climate Solutions Now initiative, the Maryland Commission on Climate Change issued a report studying building electrification, analyzing three scenarios. Don't get too caught up in the specifics of the graphs, but essentially, these scenarios include: high electrification, electrification with fuel backup (using heat pumps until temperatures drop below a certain point, at which natural gas

would kick in), and high decarbonized methane (capturing methane from alternative sources, such as poultry litter, cow manure, or landfills).

- It's important to note that the high decarbonized methane scenario won't be able to fully cover Maryland's gas demand. Even if we captured methane from all available sources, it wouldn't be enough to meet the state's gas needs. However, the report looked at these scenarios, assuming that buildings become more energy efficient over time due to energy codes and building upgrades. While energy demand increases in all cases, the grid will need to grow to accommodate this.
- For those of you dealing with utility rates, these next slides are crucial. In the high electrification case, which aligns with the goals of Climate Solutions Now for buildings 35,000 square feet and larger, natural gas prices are expected to increase by at least five times—and possibly even ten times—by 2045. You might think that less demand would stabilize prices, but that's not how it works. The natural gas infrastructure still needs to be maintained through customer rate charges, so as more buildings transition off gas, the cost of maintaining that infrastructure will be spread across fewer customers, driving rates up. This phenomenon is often referred to as the "death spiral" of natural gas, where decreasing customer numbers result in higher rates for remaining users, even if the unit price of natural gas itself doesn't change.
- To put this in perspective: right now, it costs about the same to run a heat pump or a natural gas boiler for the same amount of heat delivered due to the efficiency differences. While electricity costs more per unit of energy, heat pumps are much more efficient, making them cheaper to run. But in a future where gas prices increase five to ten times, and electricity prices only rise by a factor of 1.8, it will be significantly more expensive to run a gas boiler than to use a heat pump to deliver the same amount of heat.
- To put it simply: right now, running a heat pump is about as cost-effective as running a natural gas boiler to deliver the same amount of heat because of the difference in efficiency. While electricity costs more per unit of energy, heat pumps are much more efficient, making them cheaper to operate. However, in a future where gas prices increase by five to ten times and electricity prices rise only by a factor of 1.8, it will be far more expensive to operate a gas boiler than a heat pump. So, even if your building is smaller than 35,000 square feet, when you upgrade your mechanical systems next, it's worth considering heat pumps or at least a combination of heat pumps with natural gas backup if a full transition to heat pumps isn't feasible.
- Now, I'm going to shift gears a bit and give a brief overview of heat pumps and why they're so much more efficient.
- Are you all still with me? It's kind of dark in here... but if you're still awake, let's dive in.
- Electric resistance heating is pretty straightforward. Think of your kettle—it's 100% efficient. You put in a certain amount of energy (say, 1 kWh), and you get the same amount of energy back as heat. A gas boiler works similarly: you burn a therm of gas and get 80% to 96% of that energy back as heat. But a heat pump doesn't burn anything—it doesn't generate heat. Instead, it moves heat from one place to another.
- Most of us are familiar with air conditioners. An air conditioner cools the inside of a building by moving heat from inside to outside. A heat pump works similarly—it just reverses the process. It moves heat from outside to inside. So it's essentially an air conditioner running in reverse.
- Because it's just transferring heat, not creating it, a heat pump is much more efficient. It typically has a coefficient of performance (COP) of 3 or 4, depending on the technology. That means for every 1 kWh of electricity you put in, you get 3 or 4 kWh of heat out—essentially, you get more heat than the electricity you use. It's a bit like magic, but it's just physics—moving heat instead of creating it from scratch.
- Now, this graph shows how heat pumps used to perform and how even the best models on the market still drop off in performance under very cold temperatures. The temperature at which a heat pump can no longer meet the heating demand is called the "balance point." Below this point, the capacity of the heat pump decreases, and you

either need to add more heat pump units or rely on electric resistance or gas backup for extra heat.

- In places like Baltimore, where the design temperature is around 12°F, the latest heat pump technology performs very well, even in colder temperatures. This technology, called inverter-driven compressors, allows the heat pump to keep running at lower temperatures by using some of the heat generated by the compressor itself to maintain the refrigerant temperature. In fact, the green curve here represents one of these advanced heat pumps, which can operate at full capacity well below Baltimore's design temperature. In some cases, it can even run down to -15°F.
- Importantly, even at 12°F in Baltimore, the heat pump still maintains a COP of about 2.7, meaning it's still 270% efficient compared to a gas boiler, which typically operates at only 80% efficiency.
- This is a proven technology, often referred to as variable refrigerant flow (VRF) or mini-split systems, which operate on the same principles. It's very effective and offers a great solution for reducing energy use, especially in colder climates. While you may not have residential buildings on your campus, this small-scale equipment is increasingly appearing in various form factors. Essentially, anything that can be built as a gas system can now be built as a heat pump.
- In terms of performance, heat pumps are designed to meet strict targets and can operate down to -10°F, which is colder than we typically experience in Baltimore. The graph I've shared shows a comparison between electric and gas heating costs. As gas prices rise, the cost difference between gas and electricity will continue to favor electric heat pumps, making them an even more attractive option.
- Beyond meeting building energy performance standards, there's already a strong economic case for switching to heat pumps. These systems are available in a range of form factors, and I won't dive too deep into this unless anyone has specific questions later. On the heat pump side, there are advanced options, such as high-lift chillers that can provide both heating and cooling from the same unit. We even explored this option during a boiler plant upgrade, where using a heat pump chiller would have allowed us to avoid running boilers in the summer, effectively providing "free heating" as the cooling loop was already operating. Unfortunately, due to budget constraints, we couldn't move forward with this solution, which would have added $300,000 to the project.
- When considering heat pumps, it's also essential to look at potential building upgrades. For example, improving glazing, adding insulation, reducing infiltration, and simple air sealing can significantly reduce the mechanical capacity you need, saving you money on future upgrades.
- However, it's important to note that replacing central plant equipment with heat pumps will have architectural and structural impacts. For instance, a typical central plant boiler with a capacity of 3200 MBH will be replaced by an air-to-water heat pump with a similar capacity, but the size and weight are much greater—17,500 lbs for the heat pump versus 4000 lbs for the boiler. You'll need to plan for the space and structural support required for the heat pump. Additionally, if you're replacing a boiler with a heat pump chiller, you'll also get a new chiller plant, which can be a major advantage.
- Another consideration is electrical demand. If your equipment can't operate down to the coldest expected temperatures, you may need electric resistance backup, which could require additional electrical capacity. Most existing facilities don't have surplus power, except in cases like a former machine shop being converted into an academic building, where there's plenty of capacity. For most campuses, however, power limitations are a significant factor, and smaller projects could push you into the need for transformer vaults or even new utility services.
- At the campus level, there's a unique challenge in determining who covers energy costs and system upgrades. Unlike the private market, where tenants and building owners can share these expenses, campuses often have limited flexibility in how to allocate costs. However, if you have spaces leased to others, such as with triple-net leases, tenants may not directly pay for energy, meaning your incentives align more with saving energy and benefiting from those savings over the long term. Campuses also tend to be long-

term holders of projects, so you should be asking your engineers to provide a life-cycle cost analysis whenever you replace any gas equipment.

- For long-term planning, especially when replacing major systems, require at least a 20-year life-cycle cost analysis for the building scale, or even up to 50 years for central plant replacements, as many West Coast institutions do. In every case we've seen so far, because of escalating fuel costs, heat pumps (and sometimes even ground-source or geothermal systems) prove to be more cost-effective over 50 years. The key is to show that over the long term, the equipment will be cheaper to purchase and operate.
- This kind of analysis should be a standard practice for every equipment replacement decision. For community colleges in particular, there's also a growing need for building operators who understand how to manage these more complex systems. This is a vital area for training and education—think of it as a program that should lead to an associate's degree. The picture on the left shows a control room in a high-performance building, where trained engineers and operators handle sophisticated systems. This is where we're headed in the future, and the field of engineering and building operations urgently needs more trained technicians and operators. So, it's worth considering how you can fill this gap through your programs.
- Now, let me briefly touch on some current legislation. The 2024 session of Maryland's legislature included two key pieces of legislation that I was tracking. One passed, and one didn't. The first, the "Better Buildings Act," would have mandated building electrification in the Energy Code. It would have required new buildings and most major renovations to be electrified, meaning you couldn't build with gas and then just pay for that choice starting in 2030. Unfortunately, it didn't pass—it failed to make it through one of the two committees.
- The second bill, "Empower Funding," which did pass, focuses on shifting how utility rebates are handled. Historically, when replacing gas equipment with heat pumps, you couldn't get utility money for it because it increased demand on the electric grid. Under the new law, the rebate program will focus on carbon savings instead of just energy demand savings. This change means that if you replace gas equipment with a heat pump and significantly reduce carbon emissions, you could qualify for utility incentives. This new shift is already moving through the Public Service Commission, and we expect to start seeing those incentives in the middle of 2025.
- However, it's important to note that, like most utility incentives, the rebate will only cover a small portion of your total capital cost—not the entire expense.
- To wrap up with a big-picture thought, you could view the shift to heat pumps in two ways: either in a dramatic sense, as if "heat pumps are coming for your children," or more positively as an essential step toward future-proofing our buildings and systems. Either way, it's a significant change on the horizon. And honestly, no matter where you stand politically, heat pumps are going to make financial sense. I'm not pushing any secret agenda or climate pledge—I testify in favor of these regulations because they make sense both from an engineering and financial perspective for my clients.
- Just one last thought: places with strong energy codes and high building performance standards aren't seeing negative impacts in terms of building development. In fact, those areas seem to be doing just fine in that regard, so I don't foresee any long-term economic drawbacks.

- **Question**: Hypothetically, let's say every building on a campus is under 10,000 square feet. Even though they're smaller, the Climate Solutions Now Act still applies based on the campus's classification as a college.

  Answer: Now, if every building is below 35,000 square feet, those buildings would be exempt. This would allow you to take a building-by-building approach instead of treating the entire campus as a whole for compliance.

  But here's the catch for campuses: you typically don't have separate meters for each building, so you can only report on the 35,000 square foot buildings. However, I

anticipate that there will be efforts in the coming years to implement sub-metering, allowing for more accurate and segmented reporting.

Regarding fines, they'll only apply to the portion that you need to report. It'll be interesting to see how that works out. For buildings that rely on central plants for hot water or chilled water, there will likely be a need for BTU meters, electric meters, and possibly even natural gas meters for things like lab rooms.

It's going to require some work, and you'll probably need engineers to handle the implementation. In the next few years, you might be issuing RFQs for that kind of work. As for hiring an energy manager, you could consider partnering with a group like David Saint Jean's team at DGS, who manages an energy database, to use their energy managers instead of hiring one in-house.

But when it comes to data reporting, you'll need someone on your staff who understands energy metrics, like the difference between a kilowatt and a kWh, and can perform area takeoffs. While you can outsource some of the work to a consultant, you'll eventually want someone dedicated to helping reduce energy use on your campus—and that's where having an energy manager on staff becomes really valuable.

- **Question**: I have a question about the single-campus approach. Our campus has multiple buildings, some over 35,000 square feet and some under. Some of these buildings are separately metered, while others are metered through a single approach. What determines whether you go with a single-campus approach versus a building-by-building approach?

  Answer: That's a great question, and it's almost like a decision tree for my engineer brain. Let me try to explain it instead of just giving a decision flow. First, you need to assess what data you have and what data you're missing, and then determine if you can get the missing data. For example, do you have meters that are missing, but that you can add relatively easily?

  I think there's going to be some leeway in the first year for reporting, as not everyone will be able to report right away. However, if you fail to report for an extended period, fines can be imposed—those statutory fines could be up to $15,000 or $20,000 a day. While it's unlikely anyone will face that level of fine unless they refuse to report altogether, it's still something to keep in mind.

  So, you have a short window to get those meters installed. If you opt for a building-by-building approach, you may want to consider installing additional meters if necessary. On the other hand, if you have a central plant for heating and chilled water, you might choose a whole-campus approach, counting the total square footage across all buildings. In this case, if some of your smaller buildings are more efficient than average, it could actually benefit you.

  Ultimately, it's going to be important to run the numbers both ways—compare the individual building approach with the whole-campus approach—so you can figure out which method is most advantageous, especially as we approach 2030 when fines related to gas use will be a factor. Before then, it's really just about reporting energy use.

- **Question:** You mentioned that heat pumps don't burn electricity, but since power plants that supply electricity to the grid often burn fossil fuels, does your calculation factor in the emissions from fossil fuel consumption at the power plants when comparing the efficiency of heat pumps to gas systems?

Answer: Let me break this down into two parts.
First, building energy performance standards focus only on your on-site energy use, meaning they regulate your direct fossil fuel consumption. They don't address the electricity grid. The Climate Solutions Now Act requires the electric grid to become carbon neutral by 2045. So, while electric buildings can continue to operate with grid power, they will need to offset their carbon emissions, but the goal is to reduce fossil fuel usage over time.

You're correct that fossil fuels will still be burned by power plants, especially during peak demand times, but many states, like California, are already shifting towards cleaner energy sources. California has enough solar capacity to meet most of its demand during the year, and they're building battery storage to handle the energy needs at night. So, while fossil fuel plants may still be needed during extreme weather events or high-demand periods, the overall grid is transitioning toward renewables.

Even with fossil fuel use in the grid, when you factor in the energy losses from generation to delivery, heat pumps are still around three times more efficient in terms of carbon emissions compared to fossil fuel-based systems. And this will continue to improve as the state works toward its 2045 carbon neutrality target.

- **Question:** The expert mentioned that we're not using the term "ban" on natural gas or fossil fuels. However, it seems the idea is that the cost of fossil fuels will increase to a level where switching to electric options becomes the more economical choice. While we might not want to label it as "extortion," in a way, that's the intention—making fossil fuels so expensive that people are essentially forced to move toward electric alternatives because they won't be affordable otherwise. Is that the general idea?

  Answer: I want to clarify two things. First, I don't want to use the word "intent" because it might sound like I've had deep discussions with the lawmakers who wrote this, which I haven't. But as I understand it, the idea behind this is to make fossil fuels more expensive in the near term. The alternate compliance path is designed to shift the financial calculus, so when you're deciding to replace something like a boiler, the financial decision is different from what it would have been before this legislation.

  The graph I showed with fossil fuel prices skyrocketing—that's not something the state controls. It's a market effect driven by people pulling off the grid, which is partly due to the changed economics created by the alternate compliance path. These are two separate factors.

  The state is aiming to change the economics to make heat pumps look more favorable. Meanwhile, the E3 report predicts that as people pull off the grid, it's going to drive up the cost to maintain that service. It's not about extortion; it's just the cost of keeping that service running with fewer customers.

  By 2040, we could see gas prices double from where they are today, so if it's $5 per therm, your current gas rates of $1.43 per therm will look pretty reasonable in comparison. If electricity rates haven't escalated at the same rate, the economics could shift even further. So this is more like a market nudge. You don't *have* to follow it, but the alternate compliance path is one option to consider.
  Right, I understand. What we've seen in our audits is that in some cases, it might make more financial sense to pay the alternate compliance path, especially for clients who've just installed a new boiler plant. When looking at the large upfront

costs through a life cycle cost analysis, it can sometimes be more economical to stick with the existing system through at least 2035, rather than replacing it right away.

So, there are situations where moving to a heat pump today isn't necessarily the best choice. For example, if your boiler is at the end of its life, then a heat pump is likely the right option. However, that's not always guaranteed. If you're operating a steam central plant, a heat pump solution isn't feasible right now, aside from at the utility scale. In those cases, replacing the entire campus infrastructure with heat pumps might not make sense, and opting for the alternate compliance path would likely be the better financial decision.

- **Question:** So, if you have a 36,000 square foot building, you could remove 1,000 square feet and still be compliant, right?

  Answer: If you change your tax assessment, that will affect the entire assessment. So yes, it needs to be officially recognized as an alteration. I do think we'll see a lot of lawyers working on tax assessment adjustments in the near future, as buildings are often off by a significant margin—sometimes 10% or more—when they measure the square footage.

- **Question:** You mentioned academic applications, like gas used for welding, arts, or kilns for science labs. Are those exempt? Or do they need to be metered and counted, or do they have to be included in the overall calculation?

  Answer: Yes, those would all count as industrial uses and would be exempt. However, it's important to have the meter data to show this. For instance, in a science building, if you have gas pack rooftops and gas lines running to Bunsen burners, it can be tricky to separate that usage out because it's all interconnected. Sub-metering in such cases can be challenging, but kitchens are typically easier to manage since everything is contained in one area with a single gas line.

  It really depends on the system layout and whether you can isolate and track those uses. Industrial uses of all kinds are generally exempt. Also, true emergency generators, like those at hospitals, are exempt from alternate compliance path fines for their diesel use. But most universities won't be able to classify their standby generators as true emergency use.

  For other cases, like purchasing fuel for generators, you would report based on the amount you bought at the time of delivery. You don't have to meter usage over time, just the total fuel purchased within the reporting year.

- **Question:** Is there anything in the new law that provides funding for sub-metering of facilities?

  Answer: No, the Climate Solutions Now Act did include some provisions for low-income housing, but the funding they allocated was minimal—only $5,000,000 for upgrades, which is really not much, especially for larger apartment buildings. So, no, they didn't provide additional funding for sub-metering. You'll have to go through the usual funding allocation process, and if you need to install meters before 2030, it will need to be factored into your planning and budget for the next few years.

- **Question**: It sounds like we need to prepare for the possibility of paying some of these fees, especially if we can't meet the carbon-neutral requirements. For example, if we've recently replaced a gas-fired unit, it wouldn't make sense to tear it

out after just a year to switch to electric. In that case, we need to factor in the increased operating costs and make sure the state understands that our expenses are rising because we simply can't meet the carbon-neutral goals due to various challenges.

It's also worth noting that community colleges typically get their funding from three sources: the state, the county, and tuition. These costs will ultimately need to be covered by one or more of those sources. If each college faces fines of, say, $1,000,000, that could add up to $16,000,000 that the state, county, and students would have to bear. It's important for state agencies to be aware of this potential financial impact.

Answer: To give you a clearer idea, I've primarily worked with FCC for community colleges, and their projected fines in 2040 were nowhere near $1,000,000. To estimate this, start with your campus's current natural gas consumption in therms. Then, add $1.43 per therm—that's the conversion based on the $230 per ton of carbon cost. This amount will escalate by $4 each year.

So, for the $230 per ton carbon cost, $4 is actually a lower increase compared to how much fuel prices are likely rising. I assume many campuses are locking in their fuel prices through futures contracts, which is a smart strategy. Starting in 2030, you'll add that $1.43 (or a percentage of it depending on the year) into your gas price escalation plan. By 2040, that entire amount will be factored in.

If you do nothing, that's the additional cost you'll face. However, if you undertake efficiency upgrades, you can lower your gas consumption. Energy audits often uncover easy ways to reduce energy use by 10-15%, and sometimes we find significant issues (like a broken outside air damper) that can cut energy use by 50-60%.

So, by incorporating energy audits into your planning, you can make significant reductions in gas costs, especially in the lead-up to 2030. While it's hard to predict the exact rates for 2030, you can already estimate the added cost based on your current usage and planned efficiency improvements.

- **Question**: Are these building standards expected to eventually apply to buildings under 35,000 square feet, considering the original plan was for 25,000 square feet, and then separately for 20,000 square feet? Do we anticipate these standards being extended to the smaller buildings across our campuses?
  Answer: Currently, most states are at the 50,000 square foot threshold, not 35,000. Maryland has already been quite aggressive with its standards. The original target was 25,000, and I do think there's potential for change, though I'm not sure about the political will behind it. I usually do advocacy work every session, and I'm often surprised by what passes and what doesn't.

  So, I can't say for certain, but if it does happen, I'd expect it to be more of a mid-cycle shift, possibly around 2030. It seems like a natural step forward to move to 20,000 square feet. Right now, the only place I know of with a 20,000 square foot threshold is Seattle. One of the challenges is that lowering the threshold causes an exponential increase in the number of buildings that are affected. For example, moving from 35,000 to 25,000 doesn't just double the buildings; it could quadruple them.

So, I think we'll probably see discussion of this around the 2030 reporting cycle, but again, I don't have a crystal ball—this is just my opinion, not based on hard facts, but more on where I think we are, and partially due to staffing constraints.

- Lunch Break

- **Old Business**

- **New Business**

- **Upcoming Meetings**
  - All meetings will have Zoom/Teams access. Contact meeting host for the remote invite.
    - January 10, 2025 – Chesapeake College
    - February 14, 2025 – Howard Community College
    - April 11, 2025 – Hagerstown Community College
    - May 9, 2025 – Harford Community College
    - June 5-6, 2025 – Wor-Wic Community College