Carbon Neutrality FAQ:

Reduction Targets & Paths to Neutrality

Q. Do you have any intermediate targets before carbon neutrality, like 75% reduction by year 20XX? Is the path linear?
A. Yes! Clean Energy DC and Sustainable DC 2.0 set a target to cut emissions 50% by 2032.

Our path is not linear: the way we modeled it is based on the time it takes for equipment to turn over and when we expect certain policies to be in place for us to gradually improve our building stock or our transportation network. The gradual scenario incorporates more of a linear model while the accelerated scenario is more of a logarithmic curve because it assumes a more rapid adoption earlier on. The accelerated pathway was modeled to achieve an ~81% reduction by 2032, whereas in the gradual path, we would get to 75-80% between 2038 - 2042.

Q. What additional measures does the accelerated scenario include compared to what is included in the gradual scenario?
A. The accelerated scenario doesn't include any additional measures, but rather it assumes a faster adoption rate of those measures.

Q. Is the bar graph of strategies to get to carbon neutrality in chronological order / order of most important steps?
A. The timing of the implementation of these strategies influences their overall impact, particularly how much energy they're going to save and what their associated emissions reductions impact is. The way it's laid out is generally following the principle of adopting efficiency first, then switching to renewable sources of energy, then incorporating demand management and load shifting strategies. The reality, however, is that we will need to implement many of these strategies simultaneously. Building electrification, for example, needs to be balanced with energy efficiency and demand management strategies.

Q. Why have reductions been so flat in the last 4 years?
A. While we have continued to see efficiency improvements in both buildings and vehicles, the District has also continued to grow. While each new resident to the city adds a smaller share of additional emissions today than in 2006, the pace of growth compared to efficiency has slowed, as has the pace at which we are seeing our regional grid get cleaner, which overall is responsible for the majority of our reductions to date.

Carbon Offsets & Local Capture

Q: What role do offsets play in meeting the carbon neutrality target?
A: Our modeling indicates that we could reduce emissions 89% from our 2006 baseline, leaving 11%, or ~1.1 million metric tons of carbon dioxide equivalent (MMtCO2e) in 2050 to offset annually.

Q. The offsets must be done with the geographical boundaries with the District, not that we can pollute here in DC and then claim offsets far away, correct?
A. We are seeking input on the criteria that we should apply to offsets, but at a minimum will follow principles that any offsets we purchase are real, verifiable, and additional. We welcome any ideas on how to bring them closer to home and where we could see other benefits in addition to the greenhouse gas benefits.

Q. What is the potential for carbon capture by increasing the tree cover in the District? Is financing the planting and culture of trees outside of DC a cost-effective form of carbon offsets?
A. There are many reasons that we have ambitious goals to expand the District's tree canopy -- stormwater management, urban heat -- and while carbon isn't the main driver, there is likely a small amount of local capture possible as we work to meet our 40% canopy cover goal. The District's land area is small, so our in-city potential is likely limited -- perhaps ~1% of our total emissions. We want to explore ways of capturing the full value of our trees moving forward. We have not explored any specific offset projects/project types at this point but do plan to outline the principles by which we'd evaluate offsets in future.

Buildings & Energy

Modeling & Scenarios

Q. How does your modeling account for new electricity demand from future and additional electronic devices? Has any thought and quantification been placed within the models for future technologies that may increase demand and usage?
A. There's been a huge gain in efficiency over the last twenty to thirty years. Simultaneously, we've experienced greater electricity loads from the different types of equipment that we're now using. Our assumption was that equipment loads specifically would remain constant. We're not assuming any sort of plug-load reduction -- which is still a great thing to do and can have great impact -- but we wanted to recognize the uncertainty and ambiguity in how equipment use would unfold over the next few decades.

Q. What assumptions are used to determine fuel switching (i.e., electrification) for buildings equals less CO2 emissions?
A. We are currently at a tipping point in the electric grid where thermal electrification with the latest air source heat pump technology is beneficial, in terms of carbon emissions reductions, in all but one or two states. Furthermore, as the grid gets cleaner over time, the emissions associated with operating electric systems will continue to fall, while those of combustion-based systems will remain flat. The District, like many surrounding states, has an ambitious Renewable Portfolio Standard (RPS), which is driving the market towards this low-carbon future. In our model, we are taking credit for the effect of the Renewable Portfolio Standard, at least until it matures in 2032. By that point, our model assumes that the emissions intensity of the grid will be roughly half of what it is today.

Q. There is a sizable savings associated with Demand Management. Could you explain a bit more about the GHG savings potential associated with Demand Management, and how much is assumed to be "converted" to actual savings by 2050?
A. For this carbon neutrality model, we made some high-level assumptions with respect to demand management and storage and its effect on peak demand. We did a quick analysis of the hourly emissions curve in this area and what effect that peak reduction would have over the course of the year. Then we incorporated that into the overall emissions savings projections. Between storage and demand response, there was about a 30% peak energy reduction. Demand management is the least costly way for the District to provide electrification of buildings and vehicles while minimizing peak demand. It isn't just good from a climate perspective but also from an economic perspective.

Q. Has an analysis of the Net Zero for new construction part of the code been conducted with respect to how many new buildings will actually be built under such conditions?
A. A lot of these assumptions were developed in conjunction with the Office of Planning. We looked at what future development scenarios would look like for different types of buildings as well as what the turnover rate looks like in each of those sectors. The turnover for large commercial buildings downtown might be much less than for small single-family homes, for example. We are assuming that a significant portion (85-90%) of new buildings or buildings that undergo a major renovation, will comply with the District's energy codes. While true net zero buildings will take a while to become a reality, we wanted to be optimistic, so we assumed that if a building is considered "net zero" then it really is net zero (zero source energy).

Q. Were costs for these strategies also modeled? How much will these changes cost a typical DC household?
A. We did not model the costs, however, the relative cost of these strategies is something that we are looking to consider. With equity at the center of our planning, affordability is one of the key measures against which we plan to evaluate policy ideas, and we'll be looking for ways to address costs particularly for residents who are already cost-burdened.

General

Q. Has DOEE examined opportunities to partner with the Office of Planning to support creation of additional housing by providing density bonuses for achieving high levels of energy efficiency (Passive House, Zero Energy) and perhaps accelerate construction by allowing buildings with significant energy efficiency features bypass some ANC review?
A. We haven't had those specific conversations, but it is definitely part of the conversation we would like to have. We have been talking to the Office of Planning generally about the importance of housing affordability and density to our goals as a city and for the region.

Q. Has DOEE studied the GHG impact of HFC refrigerants used in buildings, supermarkets, vehicles, etc., especially as we move towards electrification? Is there any plan to transition to lower-GHG alternatives?
A. Unfortunately, we do not have great local data to be able to track GHG emissions like HFCs that exist, particularly in refrigerants. This does not mean, however, that we aren't going to attempt to address them. We are interested in hearing your ideas on how to address these gases, even if they didn't show up in our analyses earlier. It's important to keep in mind that there are international policies leading to the phase out of these types of chemicals. While we are interested in strategies that can be applied locally, we know that there is going to be a lot of movement toward greener refrigerants driven by international policy.

Q. How is DOEE engaging with the historic preservation review board to ensure that historic considerations don't prevent residents from making improvements that reduce their carbon emissions?
A. Over the past few years, DOEE has worked with the Office of Planning and Historic Preservation Review Board to develop sustainability design guidelines for historic properties that show how energy efficiency and solar energy can be consistent with historic properties. We have more work to do in this space and will continue to engage. Furthermore, as we focus more on the carbon resulting from construction, that will encourage the reuse of *existing* buildings which can have a much lower carbon footprint than new construction.

Q. What are / will be your biggest challenges? Reluctance of owners to spend, unavailability or excessive cost of components such triple pane windows, training of workmanship to new buildings technologies, others? Would you promote DC current in buildings?
A. One of our biggest challenges across all sectors is figuring out how we advance racial equity as we make the transition to a net-zero carbon future and how we measure progress in doing so. Specifically for the building sector, we hope to hear a lot from you all about specific challenges during our conversations about housing affordability, new construction, existing buildings and electrification, but generally we have heard those challenges regarding upfront costs/financing, workforce readiness, timing, and technical resources.

Associated Costs/Financing

Q. How do you plan to finance energy efficiency in the existing housing stock? The cost of retrofitting existing single-family homes is cost prohibitive for most residents.
A. We know that we'll need new strategies to address smaller buildings and single-family residences, as that is not an area we have focused on yet. We hope to hear a lot from our existing building efficiency discussion on ways we could approach it, and creative ideas for financing, especially strategies that assist low- and moderate-income residents. There are a lot of interesting and creative solutions already being developed to address the cost concerns of efficiency upgrades. Ultimately, we will need a wide range of solutions – there is no magic bullet when it comes to making efficiency upgrades more accessible and more affordable.

Q. Is it too early to talk about incentives for building owners to convert away from fossil fuels? Are there incentives in place now?
A. The Clean Energy DC Act allowed for the DCSEU to provide incentives for fuel switching for the first time, and DCSEU is exploring the best strategies. This year the DCSEU conducted a pilot of whole-home decarbonization in order to learn more about available technologies and potential costs of electrifying heating, hot water, and appliances. We hope to hear more ideas for effective incentives in our session on electrification.

Energy Supply & Systems

Q. Is geothermal realistic for much of DC? How much of Washington is eligible for digging geothermal wells and is it cost-effective relative to air-to-air?
A. Traditional geoexchange systems in the U.S. consist of narrow trenches close to the surface, which is easier in a rural or suburban context. But that is not to say that there aren't opportunities for geoexchange -- essentially using the earth as a heat sink -- in the District. We have some examples here in DC, including at Dunbar High School. We're looking at it in a number of our school projects because areas like athletic fields and parking lots may have more space to dig less. Geoexchange systems can also be integrated into the structural foundations of large buildings.

Q. **Do you have any examples of alternative heating methods in buildings? Is there room for technologies other than green electricity to meet goals for buildings (i.e. heat energy from the sewers)**
A. A lot of the alternative heating methods incorporate heat pump technology, but there are also renewable sources of thermal energy. We included wastewater heat recovery in our modeling as one of those local generation sources and we actually have some examples in DC where we are tapping into our sewer system. For example, part of DC Water's new headquarters building is fueled by heat pumps and heat captured from wastewater, as is the American Geophysical Union building. Wastewater heat recovery can also be configured to capture waste heat before it enters the sewer, which poses fewer jurisdictional or maintenance challenges. Solar thermal will also be an important strategy to consider – not just for direct heating – but as a technology to recharge ground temperatures in geoexchange systems.

Q. Buildings turn over very slowly, less than 0.5 percent per year. Do we not need to phase the building stock out of fossil fuels and towards net zero much earlier? Why wait until 2035 to stop new gas hookups -- why not, say, 2026?
A. We tried to pull out deadlines by which we'd need to transition systems, but the sooner we can make those transitions, the better, since cumulative emissions into the atmosphere is really the driver of global climate change. We are certainly looking for feedback on those milestones, as we also talk about what needs to be in place to support those shifts. As we think about the timeline, and ways to accelerate the transition away from fossil fuels, we also need to consider ways to promote equity so that all residents can benefit from low-carbon technologies.

Q. Will natural gas/fossil fuel exceptions be granted to food service establishments that need grills/natural gas for stoves and ovens?
A. We have been focused on the big shifts the city will need to make by 2050 and have not dived into anything this specific. We are eager to hear ideas for the barriers to transitioning off fossil fuels in the District and ways we might address it.

Q. Can you speak to Combined Heat and Power (CHP) and how you believe it fits in the portfolio of achieving carbon neutrality?
A. The benefits of combined heat and power depend entirely on the type of CHP system, the fuel source, and the application. Combustion-based CHP systems, such as gas turbines, steam generators, and combined cycle systems, are an important technology that we need to consider for grid resiliency and for applications that require steam or high temperature hot water. However, to contribute to our carbon neutrality goals, these CHP systems should use low-carbon fuels, such as renewable natural gas or hydrogen, which exist in limited quantities. Therefore we need to carefully evaluate whether combustion-based CHP makes sense on a case-by case basis, and utilize electric systems that can run on wind or solar power whenever possible. This is true for non-combustion-based CHP systems as well. Fuel cells, for example, might be beneficial for healthcare facilities or in other applications that require an uninterrupted supply of heat and power, provided the fuel cells utilize low-carbon fuels. Ultimately, achieving carbon neutrality will require a blend of technological solutions, but we need to think strategically and holistically about how to allocate and utilize our limited resources.

Q. Does the statement that fossil fuels are needed when the wind isn't blowing and the sun isn't shining take into consideration storage and the fact that it will be far more advanced in 2050 than it is today and that a lot of DC's baseload power is from nuclear?
A. Storage & demand management does play a key role in our strategy, but we acknowledge that while our model assumes continued decarbonization of our regional grid, we are not counting on the grid being fully decarbonized by 2050.

Q. Does DC use offshore wind currently, or are there any goals to do so in the future?
A. There is some wind power in our regional grid mix which we know will grow over time with the development of several offshore projects in our region. While the District does not purchase offshore wind power currently, the Department of General Services has several Power Purchase Agreements (PPAs) to provide green electricity for its own buildings, including solar and on-shore wind.

Efficiency

Q. How do savings/remaining emissions compare across building types: residential vs. commercial, large vs. small/single-family?
A. Offices, multifamily, single-family and small multifamily sectors have tremendous potential to reduce energy use, though by very different mechanisms. For example, there’s a lot of work that can be done in multifamily to reduce heating loads including envelope improvements, which have a big effect, and anything you can do to reduce domestic hot water has a huge impact. It’s challenging from an electrification standpoint but has a huge impact. In offices, we’re really starting to think about system efficiency upgrades, lighting power reductions, control strategies

that can reduce lighting and equipment loads, and strategies that decouple ventilation and air from heating and cooling. There are some areas that are more challenging, like healthcare, for example, where there are a lot of critical loads that are difficult to address from both an efficiency and an electrification standpoint.

Q. Does a smart building respond to high grid demand?
A. There are a lot of definitions of what constitutes a "smart" building, but the goal is to create an integrated system of generation and demand. In theory, yes – a smart building, or a "grid interactive" building, would respond to high grid demand by load shedding, releasing energy stored in batteries, or in some instances, turning on a source of energy generation (or some combination of those strategies). This could be something that happens automatically, or something that the building occupant initiates after a notification from the utility provider. Conversely, grid interactive buildings could respond to low demand – at night for example – by storing energy in batteries, or precooling thermal mass in the building.

Q. How exactly does a building shed the load? Disabling use of appliances? Change in the temp setpoint? Or will they need to have onsite storage?
A. Load shedding can be accomplished in a variety of ways depending on the type of building and the magnitude of desired load reductions. In the simplest example, for commercial buildings, a building owner could agree to reduce the building load by a certain amount as part of a demand response program – by turning off lighting, appliances, equipment, or by adjusting temperature setpoints. In a slightly more complex scenario, the utility could automatically adjust the setpoints of heating and cooling systems – in residential or commercial buildings - to reduce peak demand. In the future, smart appliances might prompt the user to delay operation until the grid can accommodate the extra load. You might even be able to set your washing machine or dryer to run when it will have the least impact on carbon emissions – when there is plentiful wind and solar energy, for example.

Transportation

General

Q. What is the level of coordination with transit providers like WMATA to meet these goals?
A. DOEE coordinates with WMATA and DDOT regularly and we see them as key partners in making this pathway to net-zero possible. The District, and our region, are already benefiting from WMATA's existing transportation network and our approach now is to think through what the city needs from its transit system and then figure out what WMATA's share is in making that happen. For example, WMATA is currently looking at a late night service study because it has identified the late-night, third shift as a gap. We think this is important because we know we need to make sure that we are serving all neighborhoods at all times, and improved late-night service could really benefit the city. In addition to working with WMATA, we work closely with the Metropolitan Washington Council of Governments (MWCOG), which is where a lot of conversations around regional transportation happen. We also participate in the Transportation and Climate Initiative (TCI), which is a group of the Mid-Atlantic and Northeast states that have

been working for several years to put together a program to reduce GHG emissions from the transportation sector across the region.

Q. Behavioral changes like switching from commuting by car to commuting by WMATA seem to be harder to change than shifting to an EV. Have you tried ranking the changes needed by their impact on GHG emissions reduction, weighted by the difficulty of making the changes as a way to prioritize?
A. Behavior change across all sectors is a factor and we are trying to think of creative ways for how we can move forward, not just in transportation. The circumstances that we now find ourselves in, during the uncertainties of the COVID-19 pandemic, also present an opportunity to think about how current events impact the ways people think about the future. Ultimately we hope that our policy matrix is one way that we can start to think about carbon potential, equity, as well as difficulty, all together to help prioritize our next steps.

Q. What were the assumptions around Federal clean car standards?
A. We assume that they will continue to improve in fuel efficiency in line with CAFE standards until 2025. After 2025, we assume that efficiency improvement will follow a historic linear trend.

Q. Can you please define mobility and mode shift?
A. In our conversation about mobility and mode shift, we'll primarily be talking about active modes -- biking, walking, rolling -- and public transportation and how we increase residents' use of those travel modes, rather than driving alone. Mode shifting is linked to our moveDC and Sustainable DC goals around making 75% of commute trips done without a car by 2032, so shifting trips out of single-occupancy cars to alternative and active options.

Cost

Q. **What strategies will help fill the cost gap between internal combustion engine cars and electric, especially for low- and moderate-income communities?**
A. We're thinking a lot about access to cleaner cars and about what access means. For some, it might mean ownership and for others it might mean car-sharing programs. It is our responsibility to hear from the community about their goals and how their needs would be served by different options. Hearing from the community will help us to determine what mix of incentives, programs, and availability in their neighborhoods would best meet those needs.

Q. Several cities are deciding to make mass transit free. To what extent do you think no-cost (subsidized by private/public industry) electric mass transit would accelerate emissions reductions?
A. We did not model fare-free transit explicitly, but fare reduction is certainly a strategy that could help both shift trips onto transit and out of single-passenger cars, and address the high transportation cost burden of our lowest income residents in the city. This is something both we, and DDOT will work to hear more from residents about, because while cost is a big factor for many residents, we know that mass transit must also be convenient, reliable, safe, and operate when people need to travel, so cost is just one factor that must work in tandem with other improvements.

Q. **How will Pepco affect the cost of transportation electrification? Namely, EV rates for customers and non-wires alternatives for grid upgrade requirements?**
A. Pepco, with oversight from our Public Service Commission, sets the rates of both electricity and grid infrastructure. Our approach is to lead with efficiency -- for buildings and transportation -- and DOEE is working on an electrification roadmap to model the impact of electrification on the grid and develop a phased approach to electrification based on available grid capacity.

Waste Sector

Q. Is DC looking at conducting a consumption-based GHG inventory in the future to capture the lifecycle emissions of what we consume and discard?
A. We are looking at it, but have not undertaken one ourselves, though we have had estimates provided to us based on global economic data. Currently, consumption inventories rely on using national economic data, scaled down to our local population. There's value in understanding the scale of our total carbon footprint, but the data limitations means that it would not be granular enough to allow us to track our progress over time, as we do with the traditional inventory. We are, however, comfortable making recommendations that address lifecycle emissions without knowing exactly the reduction potential or being able to track that on an annual basis.

Q. What is realistic regarding waste recycling? Today we heard reporting on NPR that municipalities have been overwhelmed during the pandemic with cardboard and other household recyclables.
A. This underscores the importance of source reduction and why it is at the top of the waste pyramid. I think we will be seeing a lot of strategies and hopefully further discussion on how we can reduce the waste stream, and how we might handle particular material streams including those recycling streams.