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April 21, 2023

Andrew Johnston, Executive Secretary
Maryland Public Service Commission
6 St. Paul Street, 16th Floor
Baltimore, Maryland 21202

Re: Case No. 9648—OPC Reply Comments on WGL's *Preliminary Market Assessment: Maryland Gas Heat Pump Technology*

Dear Mr. Johnston:

The Office of People's Counsel files the attached comments, prepared by Synapse Energy Economics, Inc. ("Synapse"), in reply to the comments filed by Washington Gas Light Company ("WGL") on April 17, 2023[1] in response to OPC's February 22, 2023 comments[2] concerning WGL's *Preliminary Market Assessment of Maryland Gas Heat Pump Technology* ("Market Assessment").[3] After OPC's February 22 filing, WGL requested leave until March 23, 2023 to file response comments[4] and the Commission on March 2, 2023 directed all interested parties to file comments by April 21, 2023.[5]

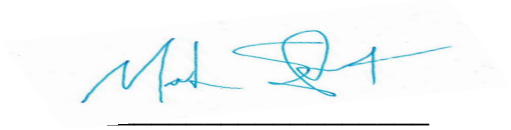
Synapse's comments explain that:

1. Even for the limited conditions that WGL assumed, WGL's heat pump performance calculations are incorrect;
2. Electric heat pumps with a more appropriate COP value would save more GHG emissions than gas heat pumps, even based on WGL's analytical framework; and
3. WGL's illustrative analysis of GHG Emissions is not helpful for understanding potential total emissions impacts in the context of meeting Maryland's state climate objectives.

[1] ML 302429.
[2] ML 301461.
[3] ML 300743.
[4] ML 301602.
[5] ML 301616.

Thank you for the opportunity to comment in advance of the Commission's consideration of this matter at the May 2 hearing on the Q3/Q4 2022 EmPOWER semi-annual reports.

Sincerely,



Mark Szybist
Assistant People's Counsel

MCS/em

cc: All parties of record

Memorandum

TO: NICOLE ZEICHNER, MARK SZYBIST, DAVID S. LAPP, PHILIP SUSSLER,

FROM: KENJI TAKAHASHI

DATE: APRIL 21, 2023

RE: COMMENT ON WGL'S RESPONSE TO OPC'S FEBRUARY COMMENTS ON WGL'S GAS HEAT PUMP ASSESSMENT

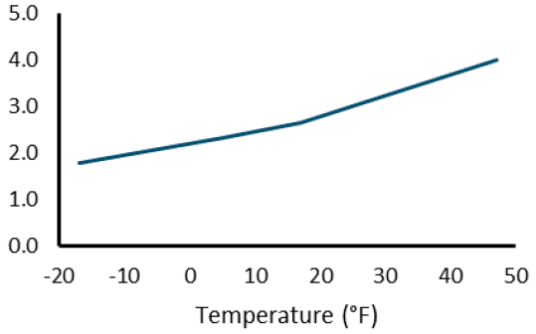
The Maryland Office of People's Counsel requested that Synapse review WGL's April 17, 2023 filing in Case No. 9648 ("WGL's April response") regarding WGL's response to OPC's February 22 comments ("OPC's February comments") on WGL's preliminary market assessment of gas heat pump technology, which was filed on January 5, 2023 ("WGL's January filing"). WGL's preliminary market assessment was prepared by GTI Energy on behalf of WGL. Below are Synapse's findings based on our review of this filing.

Even for the limited conditions that WGL assumed, WGL's heat pump performance calculations are incorrect.

WGL's response to OPC's February comments clarified and confirmed that WGL's GHG emissions analysis in Figure 2 in WGL's January filing is only meant for the limited conditions with 40°F ambient temperature and today's electric grid mix, in order to demonstrate GHG emissions reductions from gas heat pumps and electric heat pumps. WGL assumes an unrealistically low coefficient of performance (COP) of 2.4 for electric heat pumps for this outdoor condition. OPC's February comments stated that a field evaluation study of current heat pumps found heat pumps performed very efficiently with an average COP of 3.6 at 40°F. This is also consistent with the assumption used in E3's recent study for BGE titled "BGE Integrated Decarbonization Strategy." This study shows a COP curve at different temperatures and also indicates a COP of approximately 3.6 at 40°F as shown in Figure 1 below.[1]

[1] E3. 2023. *BGE Integrated Decarbonization Strategy*. Figure 29. Available at: https://www.ethree.com/wp-content/uploads/2022/10/BGE-Integrated-Decarbonization-White-Paper_2022-11-04.pdf.

Figure 1. E3 Study's COP Assumption for Electric Heat Pumps



Source: E3. 2023. BGE Integrated Decarbonization Strategy. Figure 29.

Electric heat pumps with a more appropriate COP value would save more GHG emissions than gas heat pumps even based on WGL's analytical framework.

WGL's January filing shows in Figure 2 that electric heat pumps with a COP of 2.4 save about 14.6 percent of GHG emissions relative to gas furnaces at 40°F and gas heat pumps save 32.9 percent of GHG emissions. We redo this analysis using a COP of 3.6 while keeping all the other assumptions that WGL made. Our analysis shows that electric heat pumps would save about 43 percent of GHG emissions (as expressed in carbon dioxide or CO2), as shown in Table 1 below. WGL assumes that a gas furnace would use 100 units of energy to provide 86 units of energy, leading to 86 units of emissions and calculated how much energy and emissions electric and gas heat pumps would produce. Our analysis shows that electric heat pumps would use 57 units of energy, leading to 57 units of emissions, which represents a 43 percent reduction to 100 units of energy and emissions relative to the impacts by gas furnaces. We also reproduced WGL's original calculation for electric heat pumps in Table 2 below as a reference.

Table 1. Electric Heat Pump with COP 3.6: Delivered Energy Needs and Emissions Savings relative to Gas Furnace

	Primary energy/CO2 savings	Gas transmission	Gas combined cycle	Transmission and distribution	Electric Heat Pump
Delivered Energy Needs (units of primary energy)	57.0	52.8	25.2	23.9	86.0
Efficiency		92.66%	47.80%	94.70%	360%
CO2 Savings (% of intensity for gas furnace)	-43.0%				

Table 2. Electric Heat Pump with COP 2.4: Delivered Energy Needs and Emissions Savings relative to Gas Furnace

	Primary energy/CO2 savings	Gas transmission	Gas combined cycle	Transmission and distribution	EHP
Delivered Energy Needs (units of primary energy)	85.4	79.2	37.8	35.8	86.0
Efficiency		92.66%	47.80%	94.70%	240%
CO2 Savings (% of intensity for gas furnace)	-14.6%				

WGL's illustrative analysis of GHG emissions is not helpful for understanding potential total emissions impacts in the context of meeting Maryland's climate objectives.

In its April response, WGL criticizes OPC for critiquing WGL for not using emissions rates that reflect Maryland's specific policy environment, in particular the state's RPS policy. WGL also stated in its April response that WGL's emissions "assumption is appropriate as it does not apply specifically to Maryland and the State's RPS." (WGL April response, page 5) However, WGL also made the following contradictory statements in its April response:

- "GTI Energy's intent for the graphic was to demonstrate that GHPs can reduce energy consumption under certain conditions and, therefore, can reduce GHG emissions. The graphic then compares, for illustrative purposes, GHP performance to other types of equipment under a certain set of assumed conditions that are equal among each comparison."
- "the graphic shows that the same GHG abatement potential shown in GTI Energy's broader analysis and modeling could be realized in the State of Maryland and possibly contribute to the State's climate objectives." (WGL April response, page 4)

These comments reveal that WGL and GTI Energy's analysis at best fails to serve – and at worst contradicts – the objective of the analysis. While WGL stated that the graphic (showing GTI Energy's analysis as shown in the Figure 2 in WGL's January filing) is illustrative and analyzes energy consumption under certain conditions, WGL stated its intention was to demonstrate GHG emissions reductions potential for Maryland.

As OPC stated in its February comments, the assumption of lower grid emissions rates for assessing emissions impacts from electric heat pumps is necessary because the state's RPS requires that any incremental electricity demand (such as from a new heat pump) in 2030 be met with at least 50 percent incremental renewable generation over the course of the year, and that fraction will increase further over time. WGL and GTI Energy's use of today's marginal emission rates does not provide any meaningful information about the potential GHG reduction impacts of electric and gas heat pumps.

WGL also stated that "Even with incremental demand increases met by a certain percentage of renewables, peak electric winter demand will most likely be met by fossil-fired generation brought online as necessary to meet demand on a broader, nationwide basis." There are reasons why average emission rates in the future may be more relevant to evaluating the emissions impacts from heat pumps, but even if we assume marginal emission rates, we expect that the marginal emission rates will be lower than the current marginal emissions rates in the coming decade as the region expects an increasing amount of energy storage systems on the grid and they are expected to absorb excess renewable energy and provide power when system demands are high.[2]

[2] PJM is projecting to have 3 to 4 GW of new storage facilities through 2030. See PJM. 2023. *Energy Transition in PJM: Resource Retirements, Replacements 7 Risks*. Figure 4. Available at https://www.pjm.com/-/media/library/reports-notices/special-reports/2023/energy-transition-in-pjm-resource-retirements-replacements-and-risks.ashx.