



## Built Environment and Energy Advisory Committee (BEEAC)

Meeting Summary: May 19, 2016

### MEMBERS AND ATTENDEES:

Michelle Vigen, Montgomery County (Chair)  
Bill Eger, City of Alexandria (Vice Chair)  
Dinh Tran, City of Alexandria  
Noel Kaplan, Fairfax County (by phone)  
Kate Walker, City of Falls Church  
Tim Stevens, City of Falls Church  
Loren Bruce, City of Falls Church  
Jeannine Cooper, Arlington County  
Michelle Pawlow, Arlington County  
Lisa Orr, Frederick County (by phone)  
Gina Mathias, City of Takoma Park (by phone)  
Alexis Goggans, District of Columbia  
Najib Salehi, Loudoun County  
Lindsay Shaw, Montgomery County  
Daniel Lee, WMATA  
Jeffrey Bond, Prince George's County  
Jamee Alston, Prince George's County Public Schools  
Arlene Anderson, US DOE  
Jack DiEnna, Geothermal National & International Initiative  
Guney Ogun, Virginia Tech (by phone)  
Bruce Beddow, b2E Consulting Engineers  
Doug Frasier (by phone)

### COG STAFF:

Leah Boggs, COG DEP  
Steve Beiber, COG (by phone)  
Amanda Campbell, COG DEP (by phone)  
Maia Davis, COG DEP (by phone)  
Jeff King, COG DEP  
Madison Wagner, COG DEP  
Steve Walz, COG DEP, Director  
Aaron Waters, COG DEP

### 1. **Call to Order and Introductions, Michelle Vigen, Montgomery County (Chair)**

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Chair Vigen called the meeting to order and attendees introduced themselves in person and by phone. The meeting minutes from the April meeting were approved by the attendees.

### 2. **Jurisdiction Updates**

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**Fairfax County:** Fairfax County has launched its Private Sector Energy Task Force website on the county's webpage. The county's green committee recently had discussions regarding the 2016 update of the Fairfax environmental vision document, as well as a briefing on EV charging infrastructure and how to move forward in that direction.

**Takoma Park:** The City of Takoma Park is working with sponsor Eco-Beco to tour their “tiny home” to discuss and educate residents about energy efficiency. Takoma Park is also offering free public EV charging at its 14 charging stations and hopes to be able to continue doing so to promote EV use in the city. Takoma Park also joined the US DOE’s Outdoor Lighting Accelerator and is receiving technical assistance and information resources to improve this aspect of the city. The final results of the Takoma Park Neighborhood Energy Challenge are in and 171 single-family homes (4%) participated, demonstrating a significant involvement of residents in energy efficiency efforts.

**Falls Church:** The City of Falls Church had 130 residents register for their Solarize campaign, entering into friendly competition with the City of Fairfax and the Town of Vienna. The city has also approved its budget and the Environmental Programs Coordinator position will continue to exist.

**Arlington County:** Arlington County recently launched its 2<sup>nd</sup> solar co-op and is aiming to surpass the 37 homes that enrolled under the program last year.

**Alexandria:** The City of Alexandria has recently been authorized to expand its environmental team by hiring a sustainability coordinator and will begin looking for a qualified person to fill that position in December.

**WMATA:** WMATA has published its sustainability report online for the public. WMATA is also getting close to making a selection for its solar RFP.

**DC:** The District of Columbia is getting ready to launch its Climate Ready DC plan and will have a draft recommendation ready next month. The district is also working with Siemens to utilize the company’s City Performance Tool and with the American Geophysical Union to study the effects of prolonged heat exposure on vulnerable areas of DC. The district is also working to create a comprehensive energy plan.

**Montgomery County:** Montgomery County recently hired a residential energy manager, expanding the county’s energy team. The county received its first application for its commercial PACE program and will also be offering contractor training for the commercial PACE program. Large commercial buildings (2,500 sq. ft. or larger) in Montgomery County will now be available for benchmarking. The City of Rockville, a jurisdiction within Montgomery County, has introduced a bill to join the county’s benchmarking program. The county is also launching its annual solar co-op efforts. The Montgomery County green bank submitted a report to the county executive on its mission and work. Montgomery County is also beginning to work with the Cites LEAP program to analyze its energy use and create a more efficient plan going forward.

### 3. Geothermal Technology Panel

*Arlene Anderson, US DOE*

*Bruce Beddow, b2E Consulting Engineers*

*Guney Ogun, Virginia Tech*

*Jamee Alston, Prince George’s County Schools*

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## Geothermal Heat Pump Systems

Geothermal heat pump technology uses the ground, groundwater, or surface water as heat sources or sinks in closed or open loop system, selecting a design to maximize efficiency and economics. Heat pumps enable fast heat transfer, distributed systems with no transmission investments, natural peak-load reduction through availability and storage, the ability to combine with other technology, and can be used at any scale. Geothermal energy is also a renewable resource and can be configured as central, distributed, or district energy, allowing for a wide range of opportunities.

Geothermal heat pumps are efficient, low-cost, simple to use, environmentally friendly, require no outdoor equipment, and have great potential for technological advancement. However, these pumps have a higher initial cost, are performance-dependent on ground coils and equipment, and have a limited number of qualified contractors and designers.

The US Department of Energy Loan Programs Office has over \$4 billion in remaining loan authority to help finance renewable energy and efficient projects located in the US, utilizing new or improved technology, and demonstrating greenhouse gas benefit and repayment ability. The USDOE has interest in geothermal technology and this program can help get geothermal projects financed and started. The USDOE conducted a geothermal vision study and believes that geothermal technology has the potential to save 3.4-3.9 quads of primary energy per year, defer 91-105 GW of power generation, and save consumers \$33-38 billion on utility bills by 2030. Geothermal technology has the potential to improve the load factor without load control, enhance compliance abilities under renewable portfolio standards and the Clean Power Plan, reduce carbon emissions and water use, and reduce life cycle costs. The vision study is also assessing the technical and market potential of geothermal to 2050.

### **Ground Source Heat Pump Systems and Energy Piles**

Geothermal energy use accounts for a relatively small percentage of US energy consumption, the majority of which goes into electricity generation. Despite the amount of geothermal currently being used, there is potential for this technology to make a significant impact on energy use, especially in the US where the mean ground temperature profile is suitable for this technology, making the understanding of these systems important. Geothermal system performance depends on ground quality as the heat pumps facilitate heat exchange between the ground and the building, extracting heat from the ground in the winter and injecting heat into the ground in the summer.

There are three types of ground source heat pump systems: geothermal boreholes, horizontal loops, and energy piles. Geothermal boreholes are typically used for anything from small residential to large commercial buildings. The major cost for these systems is drilling and materials, as the boreholes are about four to six inches in diameter and can go from 100 to 500 feet deep. Important design considerations include spacing, long-term effects, and ground properties like temperature, thermal conductivity, and thermal diffusivity. Horizontal loops will need a lot of open space to create trenches in the ground about six to ten feet deep, where the piping will be placed. These systems provide the least energy and have more space requirements, but are less costly than the other geothermal system types.

Geothermal energy piles are hybrid systems using deep foundation support and vertical geothermal loops for building foundation-supported heating and cooling. Typically, an existing building's

foundation will be retrofitted to incorporate the boreholes, which are about one to five feet in diameter and 40-90 feet deep. Energy piles also have some design considerations as the pile performance will be under repeated cyclic loading as the seasons change.

### **Geo-Solar Heat Pump Case Study: Minnie Howard High School Campus**

The City of Alexandria's Minnie Howard School's geo-solar heat pump system was installed in 2008 after extensive sustainability and architectural research to determine the best technology for the site. The sustainability study conducted by b2E to determine the most appropriate HVAC source evaluated air source heat pumps, which had the lowest initial cost but was least efficient; ground water heat pumps, which had higher initial costs but good efficiency; and earth-coupled heat pumps, which had the highest initial costs and the best efficiency. The earth-coupled heat pumps in a geothermal field, working in tandem with solar collector panels as a geo-solar system was the final recommended and approved solution for the school. The geo-solar system utilized pipes with double U-bends to add capacity and reliability without additional drilling and holes. This system consumes less natural gas and electricity for heating than traditional HVAC systems.

The Minnie Howard School's geo-solar heat pump system was designed to meet Alexandria's 2018 building energy target. Though it was built in 2008, the engineers planned ahead to meet the future energy efficiency targets and have higher savings. The school's geo-solar heat pump reduced energy use by 36% and will save the school about 16 million kWh and \$640,000 in energy costs over 20 years, paying back the cost of the system in five years. Using the geothermal system will also reduce 124,800 kg CO<sub>2</sub>, 415 kg SO<sub>2</sub>, and 245 kg NO<sub>x</sub> per year.

Across Loudoun County, there are several other geothermal projects. There are seven existing projects, saving a total of about 175 tons of greenhouse gas emissions per year. Loudoun County also has two projects in construction and five more in the design phase.

### **Geothermal in Prince George's County Public Schools**

The Prince George's County Public School system currently boasts six school buildings using geothermal technology for heating and cooling. Vansville Elementary, which opened in 2008, uses a geothermal system consisting of individual water-source heat pumps for classrooms and rooftop units. The piping for the geothermal system is buried under the parking lot and playground, eliminating the need for a boiler or cooling tank and allowing more classroom space. The building was also certified LEED Gold. Barack Obama Elementary, which opened in 2010, and Greenbelt Middle School, which opened in 2012, also utilize geothermal systems consisting of individual water-source heat pumps for classrooms and rooftop units and were both LEED Gold certified.

Avalon Elementary and Oxon Hill High opened in 2013 and are both using central plant style geothermal systems with multi-stacks of tandem geo-water cooled chillers. These buildings have been LEED Gold certified, but Avalon Elementary is seeking assistance with the chilled beam design to allow for greater efficiency with the system. Oxon Hill High is also having difficulties with the system and is currently manually operating the settings. The most recent geothermal school in Prince George's County is Edward Felegy Elementary, which opened in 2014. This school also uses a central plant style system with a multi-stack of tandem geo-water cooled chillers.

## Discussion

BEEAC members asked if geothermal installations were coordinated with other renewable energy efforts in Prince George's County Public Schools and were informed that the more recent geothermal projects ran in tandem with solar installations, but the older projects largely used multi-stack systems, whose more conventional design does not allow for solar gain or collaboration. Building on this question, members inquired about whether or not the significant uptake of geothermal by the school systems transferred into the private sector. Public schools have had sizeable interest in geothermal projects, but the private sector may catch up soon, as Maryland recently mandated that utilities reduce their retail sales by 2% annually, which will likely lead to an increase in privately-owned systems.

BEEAC members inquired if tapping into groundwater with open-loop systems was a difficult process and were told that open-loop systems typically use water from a water company through a heat exchanger and require permits that are not necessary for closed-loop systems, making it a more difficult process. BEEAC members were also informed that standing column wells, which may have potential within the region, also require special permitting for the 1,500 ft. depths they go to.

Meeting attendees asked if any data specific to the region had been collected that could help inform geothermal projects and policies and were told that research on the region has given a general understanding of the local geography and formation, but no temperature or thermal conductivity data has been collected. Alluvial and sediment data, which is available for the region, can provide general information on the thermal conductivity of an area and help inform policy and plans. Regional data and mapping is also better for the more central localities.

BEEAC members were curious about the best way to promote and gain support for a relatively "unseen" technology that most people have little information or awareness for. The panelists answered that the fact that this technology is largely unseen and unheard is really a benefit, especially as most heating and cooling technology involves loud and large equipment and the fact that the systems are underground makes them almost impervious to outside factors, guaranteeing the systems' lifespan for at least 50 years. Conversely, the public will be largely unaware that an entity is using renewable energy and contributing to cost and emissions savings; which is why most participants receive a plaque or award to demonstrate the work they are doing to the public.

## 4. ACPAC Environmental Justice Tool Kit

*Maia Davis, COG DEP Staff*

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The Air and Climate Public Advisory Committee (ACPAC) has been researching tools, resources, and best practices in relation to environmental justice, which the committee hopes will be a central focus of its efforts going forward. ACPAC wants local government input on the outline of the environmental justice toolkit they have put together, which is why the outline is being presented to BEEAC. ACPAC would like to gather insight on whether the information and approaches in the toolkit are useful or informative to the local governments for use in their environmental justice efforts. COG will send out a questionnaire to BEEAC members and any feedback will be needed by the end of May.

With the Environmental Justice Toolkit, ACPAC aims to help local governments identify and map underserved communities, work with these communities to assess environmental impact, provide data and resources to make an environmental plan, enable underserved communities, and support the economic and workforce development within these areas. The toolkit will help local governments achieve these goals by using the principles of environmental justice and the resources provided in the toolkit by ACPAC.

## **5. COG Updates**

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### **GHG Community Inventory Factsheet**

COG has published the final regional GHG inventory on its website and completed individual inventories for its 22 member jurisdictions. These inventories have been sent to each jurisdiction for use at their discretion. The individual inventories will not be published on the COG website. COG is willing to address any questions or concerns, and is looking for feedback on the regional report to be incorporated into the 2015 update.

### **Initial Climate and Energy Survey**

Most of the member jurisdictions have returned their surveys, but there are still a few of the larger jurisdictions that COG is waiting on responses from. At the next BEEAC meeting, COG plans to report the results of the survey and present the areas in which the region has seen the most improvement and growth.

The Multi-Sector Working Group surveys have also been returned in large part and a summary of these responses will be presented at the next BEEAC meeting, along with recommendations on how to move forward.

### **RESF-12 Annex Update**

The Regional Emergency Support Function 12 Annex update work is almost complete and the working group is sending the updated plan to BEEAC members for suggestions or feedback.

## **6. Upcoming Meetings and BEEAC Adjournment**

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- CEEPC Meeting – July 27, 2016
- BEEAC Planning Call – June 2, 2016
- BEEAC Meeting – June 16, 2016