

Penguins Lower Hill Redevelopment

Energy Sub Group October 19, 2012

Summary of Effort

State of the art energy systems, techniques and applications were researched to inform recommendations for efficient energy options for the Lower Hill Redevelopment. Feasibility studies were conducted to evaluate energy loads within the 28 acres of mixed use development. Additionally, potential partnerships outside the site¹ were considered to evaluate contribution of external loads to supplement primarily residential internal loads through the initial phases of development. Draft reports² were prepared to present results of the district modeled according to the ASHRAE 90.1.2007 standard as well as the Department of Energy's (DOE) 90.1-2004 Building Prototype models. Financial feasibility in the context of the current phasing plan and best practices for district energy project financing were presented. Feasibility of extending the existing Pittsburgh Allegheny County Thermal (PACT) high pressure steam service to the 28 acre redevelopment site was evaluated³

Research and data contributions:

Carnegie Mellon University (Center for Building Performance and Diagnostics)
University of Pittsburgh (Katz School of Business)
CJL Engineering
NRG Energy
International District Energy Association (IDEA)
GLHN Architects & Engineers
Loftus Engineers

Funding contribution:

Pittsburgh Gateways

Review and input:

Energy Sub-Group members

¹ Chatham Center, Washington Plaza, Boy Scouts, Connelly/ Green Innovators, CONSOL energy Center, Cambria Suites, some Duquesne University Buildings .Mercy UPMC was ruled out as it has its own energy plant.

² Baseline Energy Modeling & Analysis of the 28 Acre Lower Hill District redevelopment - Carnegie Mellon District Energy Screening Tool - Henry Johnstone, GLHN Engineering, February 10,2012

³ Report on the Feasibility of Extending thermal Energy Service to the 28 Acre Development Site(Former Mellon Arena) from Pittsburgh Allegheny County Thermal, PACT –Loftus Engineers March 12 2012

Incorporation in PLDP

High performance goals and district energy options as informed by the research and documentation of the Energy Sub Group have been incorporated in the Lower Hill Preliminary Land development plan (PLDP) under Sections 4.2/4.3 and 7.3. Additional inserts have been made where applicable. For e.g. Energy efficient site lighting recommendations in Section 5.4 Lighting

Section 4.2: General Regulations specifies energy improvement thresholds.

Section 4.3: Building Materials and Systems incorporates performance goals including a recommended building materials palette and strategies to enhance energy consumption reduction. These include day lighting, efficient design of wall assemblies, use of efficient lighting fixtures, intelligent building systems management.

Section 7.3: Energy District and Private Utility Systems Integration includes approach for energy district systems allocating provision for infrastructure design.

LEED Neighborhood Development

Energy efficiency recommendations are based on assisting compliance with the US Green Building Council's (USGBC) LEED® for Neighborhood (ND) rating system goals. These include requiring building envelopes and mechanical systems to be designed to demonstrate at a minimum 10% improvement over the ASHRAE go.1-2007 standard⁴ to achieve compliance with the LEED ND pre requisite for energy efficiency. Provision for street infrastructure to provide utility pathways for energy district distribution systems permits pursuing district heating and cooling in compliance with LEED ND criteria, were the energy district to be a feasible option for the neighborhood.

Pittsburgh 2030 District

2030 Districts⁵ are being formed throughout the US to provide a business model for urban sustainability. These unique public/ private partnerships bring together property owners and managers with government entities and community stakeholders to develop creative strategies for meeting energy, water and vehicle emissions reduction targets by the year 2030.

The Pittsburgh 2030 District⁶, an initiative led by the Green Building Alliance (GBA) headquartered in Pittsburgh, has proposed for the entire downtown Golden Triangle of Pittsburgh to share best practices and verification methods to inform process for meeting these goals. In keeping with their vision of sustainability for the Lower Hill redevelopment the Penguins, as Founding Partners of the 'Pittsburgh 2030 District' support the Energy Use goals of the 2030 district by targeting an immediate 60% reduction below the national average with incremental targets reaching carbon neutral by 2030.

The redevelopment project will share best practices and lessons learned to enhance performance levels across the district.

⁴ Or the current version of the ASHRAE standard as required by the current version of LEED ND at the time of implementation.

⁵ http://2030district.org/

⁶ http://www.2030district.org/pittsburgh/

Summary of Energy District and District Energy Systems Feasibility Findings

Introduction

The following is a summary of our team's analysis of district energy, geo – exchange, and solar feasibility as components of the energy and HVAC production facilities on the civic arena redevelopment site.

Background

Development Plan

The development plan currently calls for approximately 800,000 square feet of traditional commercial space (office and retail) and 1,100 units of residential / multifamily space.

Phasing

Given existing market conditions and known facts, the development will likely commence with multi – family product. The large scale office development that is planned for the site will not be developed in its entirety until a large tenant is identified that can occupy a large proportion of the space. It is not clear when such a tenant will be identified. At the same time, the retail that is planned for the site will likely not be developed in its entirety until the office development has commenced. To summarize:

Phase I: Multi – Family;Phase II: Office; and

Phase III: Retail.

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Current Relevant Activities

The Penguins anticipate that land development entitlements for the development will be secured in the first half of 2013. The SEA is currently conducting preliminary infrastructure design which calls for set - asides in the right - of - way for chilled water and steam pipes that may eventually be needed for a district system.

District Energy

<u>Background</u>

District energy plants (DEP) and combined heat and power (CHP) plants are typically used for large campus developments such as hospitals, universities, and military or government bases. These types of developments provide the large and consistent loads that are necessary to justify the expense of a DEP / CHP system.

Summary of Feasibility for Multi – Family

Traditionally, multifamily development is not an economically viable consumer of DEP / CHP output. Typical apartment development calls for each unit to be individually heated, cooled, and metered with water source heat pumps. A district system utilizing a 4-pipe system is not conducive to this model as individual metering is impractical. Developers also wish to pass as much of the

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HVAC system capital costs on to the owner / occupant, and water source heat pumps fit this economic model better than 4 pipe systems.

Summary of Feasibility for Commercial Office and Retail

Office and retail development in a dense layout is an acceptable candidate for a CHP or DEP. Data centers, 24 hour command and control centers, universities, and hospitals are ideal candidates.

<u>Summary of Feasibility of Incorporating External Loads</u>

The team identified potential external loads including Washington Plaza, Consol Energy Center, and Chatham Center. Of these three facilities, Chatham center was identified as the most promising potential candidate for external loads as both Washington Plaza and Consol Energy Center have new HVAC systems. The team conducted a meeting with Chatham Center facility engineers to examine the potential for a future district system. The following is a summary of this meeting.

Chatham Center Chilled Water

• Their chilled water plants are not that old, with nearly everything post 2000 and this equipment having 25 years of useful life if maintained. Only 1 Chatham has pre-2000 equipment, with Trane units that were installed in 1998.

Chatham Center Hot Water / Steam

- The hot water and steam plants are old and could be replaced with new systems.
 They are reportedly well maintained, according to the people maintaining them.
- The steam system at 1 Chatham really should be hot water there is no compelling need for steam. This would entail more in-building retrofits though, as some of the air handlers are steam, so that is a more costly and intrusive replacement to get everything to hot water.

Chatham Center Summary

• If 1&2 Chatham are anxious to get out of the central plant O&M business, their plant could be idled and new load installed at the 28 acres. This approach would be unlikely, because they have paid off their central plants, they are not yet in need of replacement, and would now need to sign up for a significant capacity payment on the order of several hundred thousand dollars a year.

Other Challenges to District Energy

- Utilizing external loads to support energy district feasibility could complicate development agreements with future land owners / investors.
- Highly efficient building design on the site will serve to limit loads and therefore hamper feasibility.
- A small scale district energy system is unlikely to be more efficient than a brand new stand
 alone system installed for each building.

Summary of Overall District Energy Feasibility

DEP / CHP feasibility is highly dependent on the potential for office and retail development. The concept cannot be considered potentially feasible until an anchor office tenant is identified to

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support the commercial component of the project. At the same time, the infrastructure design, as currently contemplated, does not preclude the potential for a future energy district.

Geo- Exchange

Unlike district energy, multi – family product is a better candidate for geo-exchange. The open space planned near multi – family development could accommodate the wells for the multi – family geo-exchange system. Geo- exchange may not be a good provider to the commercial components of the site due to the lack of sufficient open space to accommodate the number of wells that would be needed. In general, the denser the development, the more open space is required for wells.

Solar

Solar that is placed on the roofs of buildings including the parking garages has the potential to complement geo-exchange to serve the multi – family development. Solar may be evaluated for commercial components as well. Solar through Power Purchase Agreements (PPA) may be a middle path solution for the commercial components in order to reduce high capital costs and systems performance risks by simply leasing roofs to site a system owned, operated and maintained by third party developers.

Next Steps

- Complete infrastructure design with allotment for chilled water and steam pipes
- Continue to have discussions with district energy, geo-exchange, and solar providers
- In discussions with potential end users and developers for the commercial space, explore interest in using district energy and potentially, geo-exchange
- In discussions with multi family developers, explore the potential to utilize a geoexchange system for heating and cooling
- RFP's for developers should require highly efficient building designs and very efficient HVAC systems

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