

EXECUTIVE SUMMARY

The City of Evanston has passed a resolution that sets the goal that all city owned facilities operate carbon free by the year 2035. Essentially, this means that these buildings need to be retooled to function without the use of natural gas, or propane, or diesel fuel for building heating, water heating and cooking. Essentially, these will become all electric facilities.

The Noyes Cultural Arts Center is one of the first Evanston buildings to be studied in detail to identify a path to get to carbon neutrality. This building has some unique challenges, since it is a vintage building first constructed in 1892, plus it is an Evanston Landmark building. The amount of changes to the building exterior are limited and must follow the Evanston Preservation Commissions guidelines.

Certainly, this is primarily an HVAC study as all of the gas fired appliances such as the heating boilers, will need to be eliminated. However, as this will be a major renovation it is the ideal time to look at all building infrastructure including Electrical, Plumbing, Fire Protection, Technology and Building Envelope. Shifting HVAC loads from natural gas to electricity will dictate upgrades to the incoming electric service.

Phase 1 of this study was the “due diligence investigation of the existing systems. It was found that much of the existing MEP infrastructure is beyond its expected useable life. A number of instances were identified where the existing systems did not meet current codes. This was particularly seen in the areas of

- Ventilation
- Water Conservation
- Energy Conservation

Phase 1 of the study identified prioritized lists per discipline of upgrades that should be done together with the HVAC improvements. Four basic HVAC systems were identified as being the most efficient to get to zero carbon emissions:

- Air cooled heat pumps
- Air cooled VRF units
- Water cooled heat pumps
- Water cooled VRF units

The plan would be to install the new energy efficient MEP systems to minimize the buildings Energy Use Intensity (EUI) and then to install a photovoltaic (PV) solar panel array to make the building operate at net zero energy. Net zero energy is not a requirement of carbon neutrality. But, it is a logical next step.

The estimated construction costs to do the Phase 1 recommended work items is \$22 million. This would result in carbon neutral and net zero energy facility that has the latest technology of systems and is fully code compliant. This is likely more than the City of Evanston would spend on a single project of this type. If the project were divided into 5 equal phases done 2 years apart this would

be completed prior to the CARP goal of 2035. Assuming a 5% rate of inflation going forward the total construction cost would be approximate \$30 million.

The results of the Life Cycle cost analysis done in phase 2 of the study shows the following:

		Highest Eff	Lowest Cost
a.	Air cooled Heat pumps	4	1
b.	Air cooled VRF units	3	2
c.	Water cooled heat pumps	2	3
d.	Water cooled VRF units	1	4

Our recommendation going forward would be to implement a system of water cooled (geothermal based) heat pumps. This offers a good tradeoff between lowest lifecycle cost and highest efficiency. It also takes into account the city's concerns over refrigerant piping throughout the facility with any of the VRF options. The higher efficiencies that the water cooled heat pumps achieve are also a prerequisite for some of the larger incentive dollars available for implementing this type of a project. Best case scenario would be that approximate \$2 million in incentives could be achieved.