Andrew Haines

From: Carol Houck
Sent: Monday, November 24, 2014 6:08 AM
To: Polly Sierer; Stu Markham (stu.markham@gmail.com); 'luke@chapmanfornewark.com'; 'haddenmargrit@gmail.com'; Todd Ruckle (ruckled2@gmail.com); Robert Gifford; 'marknewarkfirst@aol.com'
Cc: Lou Vitola; Rick Vitelli; Andrew Haines
Subject: FW: Questions about Proposed Substation

Mayor and Council – Please find the responses to Councilman Morehead's questions posed to Rick Vitelli on Thursday afternoon. We turned them around as soon a possible as Rick was in interviews most of the day Friday and away from the office Thursday. Thank you. Carol

From: Mark Morehead [mailto:marknewarkfirst@aol.com]
Sent: Thursday, November 20, 2014 11:29 AM
To: Rick Vitelli; Carol Houck
Subject: Questions about Proposed Substation

Hi Rick,

As you know, I like to understand our electrical distribution infrastructure, as much as a layman can. I have been reading the Quad 3 report dated 30 Oct 2014. I have a few questions that I was hoping you could answer.

1. If a proposed substation were to be built at the STAR campus, how would it be connected back to our existing Kershaw substation to provide backup in case Kershaw went down completely? (This benefit is mentioned on page 2 of the report.) Please supply the load study information for this scenario.

The new feeders out of the Star Campus substation will be underground until they tie into existing aerial circuits along the Amtrak Railroad (feed Phillips Ave. sub), South College Avenue(one circuit feeds Wyoming road sub and one circuit feeds both Chestnut Hill road and S. Chapel sub) and the Christina Parkway (feed Sandy Brae sub). All load values used are highest peak values for all circuits

The new outgoing feeders will feed:

feeder1	Bloom	324kva
Feeder2	Wyoming road sub	17,389kva
Feeder3	S. Chapel and Chestnut Hill road subs	8151kva
Feeder4	Phillips Ave sub	10,500kva
Feeder5	Sandy Brae Sub	10,291kva

Kershaw Sub will feed:

3404	East Main Sub	17,389kva
3413	West Main sub	23,700kva
3414	UD Science Center	5700kva

If Kershaw sub goes down

3414 can be fed from Star substation Wyoming road feed 17,389+5700=23,089kva

3413 can be fed from Star substation Sandy Brae feed 23,700+ 10,291=33,991kva

3404 can be fed from Star substation Phillips Ave feed 17,389+10,500=27.889kva (some emergency construction taking several hours would be needed at Kershaw sub to tie the 2 feeders together

The Star substation would have 93,444kva from existing loads + 61,800 kva load from Star campus estimate =155,244kva on 2- 60/80/100 mva transformers (200,000 kva capacity)

2. I understand it takes two years to get approval from PJM for an interconnect to their 138 kV supply system. What is the justification to start spending money before receiving the authorization to interconnect?

Engineering work needs to be done before approval. PJM and DPL require this info. The engineer has to be on board to answer follow up questions and to start the design process. Depending on the factory backlog, it can also take up to 1 year to receive the transformer after ordering it. The design process with DPL and the bid adds time.

3. Does it cost us more to install the 34,500 V distribution system underground versus overhead on the STAR campus? Is UD agreeing to pay for this difference?
Underground does cost more. The University is installing all of the conduits and manholes for the distribution and substation feeds. The UD has not agreed to pay for the difference in cost between aerial and underground

4. Please provide the historical electrical load data supporting the statement on page 3 of the report, "this area of the City is experiencing rapid growth".
There has been an increase from 12,205 kva to 14,198 kva on South College and Bellevue road since 2009. This number does not include the expected 1,200kva increase from GE composites in 2015 or the anticipated 500kva load for the second half of the old Chrysler Administration building.

5. Each of the scenarios in the report seem based on the final proposed total load when the STAR campus is fully developed, something the university is currently saying may not happen for possibly several decades. Even the single transformer scenario identified, in the "Budget Central" document dated 11/7/2014, would provide enough power to supply the whole City currently, if this power could be distributed. Since the Quad 3 mandate is to recommend how to power only the STAR campus, it seems there is opportunity to scale back on the size of the 138 kV x 34.5 kV transformers being recommended in the short and mid-term.
The second price estimate only included a price for one transformer and only 2 outgoing feeders for the Star Campus. If the feeders and breakers are installed for the city substations and Bloom, the single 60/80/100 mva transformer would have just enough capacity to feed the City's existing load of 92000-93000 kw and the estimated 1700kw load addition on Bellevue road and the Chrysler admin building. This leaves about 5300kw for Star Campus Load and any growth elsewhere.

6. Page 11 mentions the concept that large transformers this size are not stock items. What is the largest size that would be a stock item? Using a greater number of smaller stock transformers would clearly require more installation space, but might make sense to minimize our immediate expenses. Stock transformers could be quickly augmented when and if required by future load expansion. (The "terroristic" commentary on page 11 indicates having more smaller transformers may be a wiser course of action for other reasons as well.) I am interested in your thoughts on this strategy.
Power transformers are not stock and are made to order, however, used or rebuilt transformers are available on the market if one can be found at the correct size with the same high voltage and low voltage specifications. Using a greater amount of smaller transformers increases the cost of the 138kv ring bus, number of breakers, relaying, space requirements and complexity. This will greatly increase the substation cost. Also the incremental cost of buying say a 50mva transformer is not twice as much as buying a 25mva. For example the transformer we purchased in January of this year was a 10mva unit and cost $384,900 vs $330,846 for a 7.5mva unit which we didn't buy.

7. If Newark must immediately install stranded supply overcapacity, how much is UD paying for the benefit of having immediate, and effectively unlimited, electrical supply on a moment's notice to this location? Otherwise, wouldn't we

be forcing the existing electrical customers to shoulder the burden of effectively subsidizing this expense, for UD's benefit, until the proposed electrical load was developed?
The subsidization argument could be made if the City was paying cash for the substation today. The cash used for the substation would have been contributed by previous and current electric customers for the benefit of future electric customers. However, our goal is to secure long-term financing for the substation, which will allow us to recover the costs of the substation over the next 20 years with electric rates generated by users over the next 20 years. It is true that the UD will benefit from the ability to market a site with adequate infrastructure, but the City will also benefit terms of tax base and electric rate base. With that said, there are certain improvements to the site that benefit only the future users of the site, and considerations such as recovering those costs with an electric connection fee or impact fee are likely. However, electric system capacity must be planned in advance (we can't wait for blackouts to increase electric system capacity), so we have to make the investment in the substation and related improvements now, and recover the costs over time.

In addition we have discussed internally the following:

There are a couple of ways to do it:
(cost of onsite distribution material and installation+ cost of scaled down sub) divided by acres since the cost of the scaled down sub and the onsite distribution only benefit the Star campus
or
(cost of onsite distribution material and installation+ (cost of complete sub*2/7)) divided by acres since the star campus is only using 2 feeder breakers out of 7 proposed

8. Are the proposed circuit connections from the proposed STAR substation to the existing Sandy Brae, Phillips, Wyoming, and East Chestnut substations underground or overhead?
The new feeders out of the Star Campus substation will be underground until they tie into existing aerial circuits along the Amtrak Railroad (feed Phillips Ave. sub), South College Avenue(one circuit feeds Wyoming road sub and one circuit feeds both Chestnut Hill road and S. Chapel sub) and the Christina Parkway (feed Sandy Brae sub).

And from second email:
9. I notice Quad 3 recommends setting up a ring bus for the scenario of a single transformer fed by two supply lines, but did not indicate setting up a ring bus for the scenario of two transformers fed by two supply lines. Wouldn't we want a ring bus in either scenario, to provide maximum versatility of running any transformer from either supply line?
A ring bus is required by DPL for any connections to their 138kv system so one is needed for any substation configuration.