November 12, 2013

TG-131128

Appendix "A"
Report PW12017b

Via email to: Charlene.mckay@hamilton.ca

Charlene McKay, B.Sc., CRSP
Senior Project Manager Compliance
City of Hamilton
Planning, Capital & Compliance Section
Corporate Assets & Strategic Planning Division
28 James Street North, Lister Block, 5th Floor
Hamilton, Ontario
L8P 4Y5

Re: Compressed Natural Gas (CNG) Building Upgrade Assessment
2200 Upper James & 330 Wentworth Facilities, Hamilton, Ontario
Evaluation of CNG Reports

Dear Charlene:

AMEC Environment & Infrastructure, a Division of AMEC Americas Limited (AMEC), completed a Compressed Natural Gas (CNG) Building Upgrade Assessment ("CNG Assessment") of the required upgrades to two (2) City owned facilities in the event that the City decides to expand its current use of CNG fueled buses.

The assessment was completed at the following two (2) City of Hamilton facilities:

- Hamilton Street Railway (HSR) Facility located at 2200 Upper James Street, North; and
- 330 Wentworth Street, North.

The objective of the CNG Assessment was to provide the City with a report that outlines the requirements for each facility to allow the City to *"reliably and safely operate, maintain and store CNG vehicles".*

Two (2) separate Draft reports, dated September, 2013, were submitted by AMEC via email to the City on September 27, 2013. Subsequently, a meeting was held on October 17, 2013 to discuss the AMEC reports. During this meeting the City revealed that two (2) separate and independent reports had been previously commissioned by the City from Clean Energy Fuels and that AMEC's work was later commissioned in order to obtain a second opinion.

The difference in the cost estimates provided by Clean Energy and AMEC is significant. Clean Energy estimated the cost of upgrades to both facilities to be $1.56M (2200 Upper James) and $1.67M (330 Wentworth). AMEC estimated the cost of upgrades to be $300k (2200 Upper James) and $200k (330 Wentworth) based on our accepted proposal and Class D – Order of Magnitude cost estimates.

AMEC Environment & Infrastructure,
a division of AMEC Americas Limited
505 Woodward Avenue, Unit 1
Hamilton, Ontario L8H 6N6
Tel (905) 312-0700
Fax (905) 312-0771
www.amec.com

During the October 17, 2013 meeting, the City requested that AMEC conduct a review of two (2) separate Clean Energy reports and compare the contents to the work completed by AMEC. These reports were subsequently provided by the City to AMEC via email on October 21, 2013 and are summarized as follows:

1. City of Hamilton Transit, Hamilton, Ontario, Canada, CNGV Facility Assessment, dated April 22, 2013 (otherwise known as 2200 Upper James Street North); and

2. City of Hamilton Fleet Services, Hamilton, Ontario, Canada, CNGV Facility Assessment, dated April 26, 2013 (otherwise known as 330 Wentworth Street North).

The City requested that AMEC complete the following tasks:

- Compare the contents of the AMEC and Clean Energy reports and determine the difference between the cost estimates contained in both reports; and
- Identify the work required to each ensure each facility is operating at current regulatory standards.

AMEC's comparison of the two (2) sets of reports is documented in the attached **Table 1** for the 2200 Upper James Street, North Facility and in **Table 2** for the 330 Wentworth Street, North Facility.

During evaluation of the two (2) sets of reports AMEC was also requested to provide comments on two (2) key questions which are re-iterated below along with AMEC's opinion:

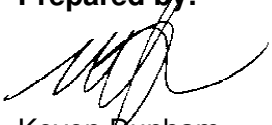
1. **What is the "real" cost estimate to upgrade the facilities?**
   It remains AMEC's opinion that the cost of upgrades to each facility is in the range of $300k for 2200 Upper James and $200k for 330 Wentworth as stated in the AMEC Draft reports submitted to the City of September 27, 2013. These estimates do not include Design Fees or Permit Fees which could add an additional 15% and $8,000 respectively to each estimate as noted in S. No 6&7 of both Tables 1 and 2.

2. **What are the priorities?**
   The City should upgrade and correct the ventilation in each facility in the areas where ventilation does not currently meet regulatory or code requirements.

CLOSURE
We trust that this evaluation of the two (2) sets of separate reports by Clean Energy and AMEC meets with the City's current requirements and provides the City with sufficient information to make an informed decision of the required upgrades to each facility.

Respectfully submitted by,
AMEC,

Prepared by:



Keven Dunham,
Project Director

Approved for signature via email

Rahat Khan, P. Eng.,
Senior Mechanical Engineer

cc: Peter Beukema, Steve Dillon, Igor Bozic.

TABLE 1 -

CITY OF HAMILTON - COMPRESSED NATURAL GAS (CNG) ASSESSMENT

2200 UPPER JAMES STREET - EVALUATION OF REPORTS

S. NO	ITEMS INCLUDED IN CLEAN ENERGY REPORT	COST ESTIMATE BY CLEAN ENERGY ($)	ITEMS INCLUDED IN AMEC REPORT	COST ESTIMATE FROM AMEC ($)	REMARKS
1	Have recommended addition of ten (10) dedicated exhaust fans interlocked with existing wall louvers for parking garage. In their write up they have mentioned ventilation requirement of63,685 LPS (134,940 CFM) and the existing exhaust capacity is 59,230 LPS (125,500 CFM).	309,798	Have recommended to modify the two (2) transfer fans, transferring air from parking space to maintenance area, to take air from the outside.	10,000	This will provide 4 ACH and as per NFPA 30A electrical wiring and equipment could be unclassified if area has 4 ACH
2	Have recommended addition of nine (9) dedicated exhaust fan for repair area and one exhaust fan for paint area with make up air through roll up doors. Have recommended 96,726 LPS (204,950 CFM) airflow to the garage area based on floor SF area. Existing air supply/exhaust from the area is 34,847 LPS (73,840 CFM) resulting in 2.80 ACH		Have recommended to add one additional supply and exhaust fan of 15,100 - 16520 LPS (32,000 - 35,000 CFM) capacity to the maintenance area to increase regular air change rates to 4 ACH. At present air exhaust from the area is 34,847 LPS (73,840 CFM) and 4 ACH would require 49,790 LPS (105,500).	41,375	Cost for items 1 and 2 is combined under S. No 1 item
3			Also, it is recommended to add four (4) additional exhaust and supply fans of 18,878 LPS (40,000 CFM) capacity each to provide 8 ACH rate of air exhaust during purge mode with air intake through entrance doors as an option.	165,000	This fan of say 50,000 CFM will result in dedicated air exhaust of 4 ACH
4			Have not taken into account supply fan requirement in the paint shop area as there will be no change in the working strategy of painting area		
5			Since there is no plan to increase # of repair bays with the increase of CHGV's as such associated areas comprising of welding & painting areas were not considered for upgrades		
6	Design Fees	110,000	Not taken into account	0	Can add 15% for design work = approx. $45,000
7	Plan review and permit fees	8,000	Not taken into account	0	Can add $ 8,000 for permit fees
8	Have recommended vapour tight access doors, windows for maintenance area	10,045	Not required since area is not classified and adequate ventilation is recommended	0	

9	Roof modifications and structural supports	51,408	Cost for partial openings and changes included in the cost but no major modifications were considered & with reduction of mechanical work civil scope is reduced	25,000	
10	Safety signage and specialties	20,114	Considered part of regular safety reviews and maintenance work. Not considered separately as part of upgrade	0	
11	Rigging, man-lifts scaffolding, etc	34,767	Included as part of mechanical work	0	
12	Gas detection and electrical work	715,693	Five (5) methane detection sensors were considered for the maintenance area as methane detection system is already in place. Client to re-confirm existence of detection system for the area.	43,125	
13	Heating equipment replacement (unit heaters)	299,998	Not considered since area classification is not required after 4 ACH ventilation	0	
14	Considered existing ceiling mounted lighting fixtures in hazardous location and suggested replacement with Class 1 Div 2 rated fixture or modification of lighting fixtures (move outside of hazardous zone)		No electrical code requirement is highlighted in the relevant CSA, NFPA and OESC Codes for this. AMEC did not considered this area hazardous (Class 1, Div 2)		CE considers the Building Classified hazardous location (Class 1, Div 2). AMEC did not include this in the budgetary pricing
15	Suggested upgrade of electrical system to introduce shut-tripping circuit breakers to de-energize equipment which may be considered spark inducing devices		This is suggestion. However, no electrical Code requirement was found in the relevant CSA, NFPA and OESC Codes for this.		This suggestion is not included in AMEC budgetary pricing.
16	Suggested upgrades of ten(10) exhaust fans		AMEC suggestion is two fans(see mechanical) and therefore less power supply requirements (protection and feeder runs)		AMEC budgetary pricing includes power supply for two fans only.
17	Indicates installation of new Class 1 Div 2 rated emergency lighting		AMEC did not consider this area hazardous (Class 1, Div 2) therefore no upgrade/modification was suggested		This suggestion is not included in AMEC budgetary pricing.
18	No suggestion for remote ground clamps to ground vehicles while parked for maintenance		Suggested by AMEC, however not included in budgetary quote since it is not a Code requirement		Not included in both budgetary pricing
19			Environmental Approvals	19,800	
	Totals:	**1,559,823**		**304,300**	

Notes:

1) Since activities / work load in associated areas were not going to change with the increase in the # of CNGV's no modifications were considered for those areas as at present they comply with the relevant standards.

2) Have recommended to ensure that all exhaust fans are Class 1, Zone 2, Group 11A rated and should be self monitoring and alarm on failure. If this is not found during detailed designing then upgrades / change of fans is to be considered.

3) Contingency has been added to AMEC's itemized costs.

TABLE 2 -
CITY OF HAMILTON - COMPRESSED NATURAL GAS ASSESSMENT
330 WENTWORTH DR. - EVALUTION OF REPORTS

S. NO	ITEMS INCLUDED IN CLEAN ENERGY REPORT	COST ESTIMATE BY CLEAN ENERGY ($)	ITEMS INCLUDED IN AMEC REPORT	COST ESTIMATE FROM AMEC ($)	REMARKS
1	Have recommended addition of eight (8) dedicated exhaust fans, three (3) supply fans for parking garage. In their write up they have mentioned ventilation requirement of 51,340 LPS (108,783 CFM) and the existing exhaust capacity is already over this requirement	337,760	Have recommended two supply fans of 40,000 CFM - 45,000 CFM each to provide dedicated air supply to parking area instead of air infiltration from maintenance area	143,875	This will provide 4 ACH and as per NFPA 30A electrical wiring and equipment could be unclassified if area has 4 ACH
2	Have recommended addition of six (6) dedicated exhaust fan for repair area with make up air through roll up doors		Have recommended that to double ACH rate to 8 during purge operation air intake could be from the parking area entrance doors. Mechanical air exhaust capacity from the area is already exceeding 8 ACH		Cost for items 1 and 2 is combined under S. No 1 item
3	Have recommended explosion proof roll up door motors		Have recommended one new exhaust fan in the maintenance area to ensure air exhaust from the area instead of ex-filtration to parking area and operate area at over 4 ACH		This fan of say 50,000 CFM will result in dedicated air exhaust of 4 ACH
4			Have recommended two additional supply and exhaust fans in the maintenance area to provide 8 ACH during purge mode		
5			Since there is no plan to increase # of repair bays with the increase of CHGV's as such associated areas comprising of welding & painting areas were not considered for upgrades		
6	Design Fees	124,150	Not taken into account	0	Can add 15% for design work = approx. $30,000
7	Plan review and permit fees	8,000	Not taken into account	0	Can add $ 8,000 for permit fees
8	Door, windows, partition walls and vapour proofing	4,647	Not required since area is not classified and adequate ventilation is recommended	0	
9	Roof modifications and structural supports	63,998	Cost for partial openings and changes included in the cost but no major modifications were considered & with reduction of mechanical work civil scope is reduced	17,500	

10	Safety signage and specialties	20,120	Considered part of regular safety reviews and maintenance work. Not considered separately as part of upgrade	0	
11	Rigging, man-lifts scaffolding, etc	34,800	Included as part of mechanical work	0	
12	Gas detection and electrical work	739,941	Methane detection system is already in place. Any upgrades to the system should be part of regular maintenance	13,125	
13	Heating equipment replacement (unit heaters)	340,800	Not considered since area classification is not required after 4 ACH ventilation	0	
14	Indicates requirements for Methane Gas Detection, as required by Code		No electrical requirement is highlighted in the relevant CSA, NFPA and OESC Codes for this		
15	Considered existing ceiling mounted lighting fixtures in hazardous locations and suggesting replacement with Class 1 Div 2 rated fixtures or modification of lighting fixtures (move outside of hazardous zone)		No electrical Code requirements highlighted in the relevant CSA, NFPA and OESC Codes for this. AMEC did not consider the area to be hazardous (Class 1, Div 2)		CE considers the Building Classified hazardous location (Class 1, Div 2). AMEC did not include this in the budgetary pricing
16	Suggested upgrade of electrical system to introduce shut-tripping circuit breakers to de-energize equipment which may be considered spark inducing devices		This is suggestion. However, no electrical Code requirement found in the relevant CSA, NFPA and OESC Codes for this.		This suggestion is not included in AMEC budgetary pricing.
17	CE suggested upgrade of eight(8) exhaust fans and three(3) supply fans and seven(7) new exhaust fans for repair garage and welding room		AMEC suggested six(6) fans(see mechanical) and therefore less power supply requirements (protection and feeder runs)		AMEC budgetary pricing includes power supply for six(6) fans only.
18	Indicates installation of new Class 1 Div 2 rated emergency lighting		AMEC did not consider this area hazardous (Class 1, Div 2) therefore no upgrade / modification was suggested		This suggestion is not included in AMEC budgetary pricing.
19	No suggestion for remote ground clamps to ground vehicles while parked for maintenance		Suggested by AMEC, however not included in budgetary quote since it is not a Code requirement		Not included in both budgetary pricing
20	Removal of existing unit heaters and installation of IR tube heaters. It is stated that existing heaters emit open flames and are not Code compliant		AMEC did not consider this (see mechanical) and therefore no power supply requirements were included in the budgetary quote including removal of existing feeders		This suggestion is not included in AMEC budgetary pricing.
21			Environmental Approvals	16,500	
	Totals:	**1,674,216**		**191,000**	

Notes:

1) Since activities / work load in associated areas was not going to change with the increase in the # of CNGV's no modifications were considered for those areas as at present they comply with the relevant standards.

2) Have recommended to ensure that all exhaust fans are Class 1, Zone 2, Group 11A rated and should be self monitoring and alarm on failure. If this is not found during detailed designing then upgrades / change of fans is to be considered.

3) Contingency has been added to AMEC's itemized costs.