Project Planning Report for the Southeast Campus Electrical Plan

I. Membership

Elizabeth Sisam - Assistant Vice-President, Campus and Facilities Planning
Ron Swail – Assistant Vice-President, Facilities and Services
Bruce Dodds - Director, Utilities and Building Operations
Andy Fok - Manager, Electrical Systems
Shirley Roll – Director, Facilities Management & Space Planning, Faculty of Medicine
Monica Contreras – Assistant Dean, Director of Planning and Information Technology, Faculty of Arts and Science
Catherine Gagne – Chief Administrative Officer, Faculty of Applied Science and Engineering
Professor Stewart Aitchison – Vice-Dean, Research, Faculty of Applied Science and Engineering

II. Terms of Reference

The committee was struck to predict future growth and new research initiatives that will fall within a 5-year horizon so that the necessary modifications to the electrical infrastructure required to accommodate these changes could be planned in advance.

II. Background Information

Power required for building sites on the University's Master Plan slated for development in the near future has been analysed and will be provided by major infrastructure additions by Toronto Hydro initiated in 2003 and 2005. However, renovations to existing buildings that use disproportionately large amounts of the limited electricity capacity remaining on the University's own distribution system are more difficult to forecast. In some parts of campus, where infrastructure is near the end of its service life, and feeder loops are at capacity, renovations that include substantial additions of large research equipment can require significant changes to be made to the system before the laboratory projects can proceed. In some cases this may mean re-feeding buildings from another source, either from the University of Toronto or Toronto Hydro. In this latter situation, such a change may be accompanied by a large cost renovation of the existing electrical rooms or substantial reworking of existing distribution infrastructure.

While the committee initiated planning to determine power requirements within the precinct the state of the existing infrastructure and known upcoming renovations clearly indicate that the southeast precinct of the campus requires early remedial action. The first priority being the Wallberg Building and the second priority the Medical Sciences Building. This report will address the Wallberg Building and a subsequent plan will address the Medical Sciences.

II. Impact on Academic Plan

Failure to deal with the capacity shortage will mean that research using large equipment may have to be scheduled, curtailed, or relocated to another building. (In recent months, one researcher in the Wallberg Building was asked to run experiments involving use of an electric furnace only during the night-time to avoid tripping off the entire building.

V. Project Description

Wallberg and Pratt Buildings

The Wallberg Building is fed from Loop # 1 on the University's 4,160 volt system. The Pratt Building is sub-fed from the Wallberg Building at 4,160 volts. The Engineering Annex and the Electrometallurgy Buildings are sub-fed from Wallberg at 600volts. Therefore, when forecasting the needs of the Wallberg Building it is necessary to also add the loads in the Pratt Building, Engineering Annex and Electrometallurgy.

Loop#1 also serves Mechanical Engineering, Rosebrugh, Fitzgerald and the Sigmund Samuel Library directly, and the Sigmund Samuel Library sub-feeds the Canadiana Building at low voltage. Loads on the loop have grown to the extent that the ability to feed buildings around the loop in either direction has been compromised. If a failure occurred on one segment of cable, the intact segments could not handle the entire load from all these buildings. Buildings at the end of the line would be without power until the failed line could be repaired or load shedding is imposed, which may have an impact on research activities. This level of risk from prolonged outages is further enhanced by the aging of cables and switchboards.

The Faculty of Applied Science and Engineering has indicated that the following research initiatives with anticipated increases to the electricity load of the Wallberg or Pratt Building will take place in the foreseeable future (i.e. within a 5-year horizon):

User	**Net Incremental Power Increase (kVA)**	**Comments**
Hospital Fund application		Will be located in the Pratt clean room and the Bahen Centre
Prof. Perovic (MSE)	15	Estimated for a new SEM
Prof. Barati (MSE)	20	
Prof. Utigard (MSE)		No information so far
New hires in MSE	40	Estimated at 2 x 20 kVA
Pratt cleanroom	210	This equipment is already wired up but has not been fully utilized (i.e. not included in existing metered loads for the building). As equipment is replaced the load will come back.
Surface Science Facility	0	Operational (i.e. any load increase should already be included in existing metered loads for the building).
ECTI e-beam facility	180	
Chemical Engineering and Applied Chemistry	0	No major changes predicted
Totals	**465**	

Including these new projected loads, it is estimated that the Wallberg/Pratt buildings requirements will be as follows:

Existing (2006-7) loads, Wallberg	935 kVA
Existing (2006-7) loads, Pratt	478
Total existing loads	1,413 kVA
New projects	465 kVA
Total required capacity	1,878 kVA

If 2,500 kVA were obtained, the resulting margin of 33% excess capacity should provide ample room for growth.

The obvious plan would be to re-feed Wallberg directly from the Toronto Hydro Electric System (THES) because 2.5 MW would be sourced from their existing infrastructure. In addition to work from the THES, the University would have to provide a new 13,800 volt switchboard because the building is currently on 4,160 volt supply. There is no space for this equipment within the Wallberg Building therefore it would have to be located in an addition in the parking area directly behind the Wallberg Building. Two parking spots must be removed for the additions. Transformers in the Pratt Building will have to be replaced with 13,800 volt primary equipment. (Transformers for Wallberg are presently being replaced with dual primary voltage to handle either voltage.)

VII. Special Considerations

Campus Planning

The area north of the Wallberg Building is indicated as development site #16 on the Campus Master Plan. Therefore the design and routing of the cable ducts and the location of the switchgear room behind the building must reasonably minimize future interferences with potential new structures that could be sited there.

Landscaping

Routing cable under university roads and paved or landscaped areas must be performed by tunneling or open cut excavations with restoration of the area to the original condition included in the project.

Deferred Maintenance

The change from 4,160 to 13,800 volts as the primary feed to the building requires replacement of some University equipment. However, a substantial amount of this equipment has exceeded its recommended service life therefore this project will further reduce the University's backlog of renewal needs at the same time as increasing the electrical capacity.

VIII. Resource Implications

Capital Cost Estimate

The Total Project Cost Estimate including site restoration will be $3.0 million. (Appendix A)

Operating Costs

Operating costs will not be significantly altered by the re-configuring of the feed to the building. Increased power costs will be incurred by the University as a result of the research performed in the new labs being planned for the building and will be captured in the reports for those facilities.

Secondary Effects

Two reserved parking spaces at the rear of the Wallberg Building will be eliminated.

IX. Funding Sources

This project will be funded under the Capital Renewal Program 2007/08 .

X. Schedule

The increased power capacity is required as soon as possible. Immediate implementation will occur with approval of this project planning report.

XI. Recommendations

It is recommended that the Planning and Budget Committee recommend to the Academic Board that:

1. THAT this report be approved in principle, and
2. THAT the project scope described for a capital cost of $3.0 million, with funding from the Capital Penewal Program 2007/08 be approved.

Appendices:

A. Total Project Cost Estimate
B. Site Plan
C. 200 College Street Building Envelope, Site 16

APPENDIX A
TOTAL PROJECT COST ESTIMATE

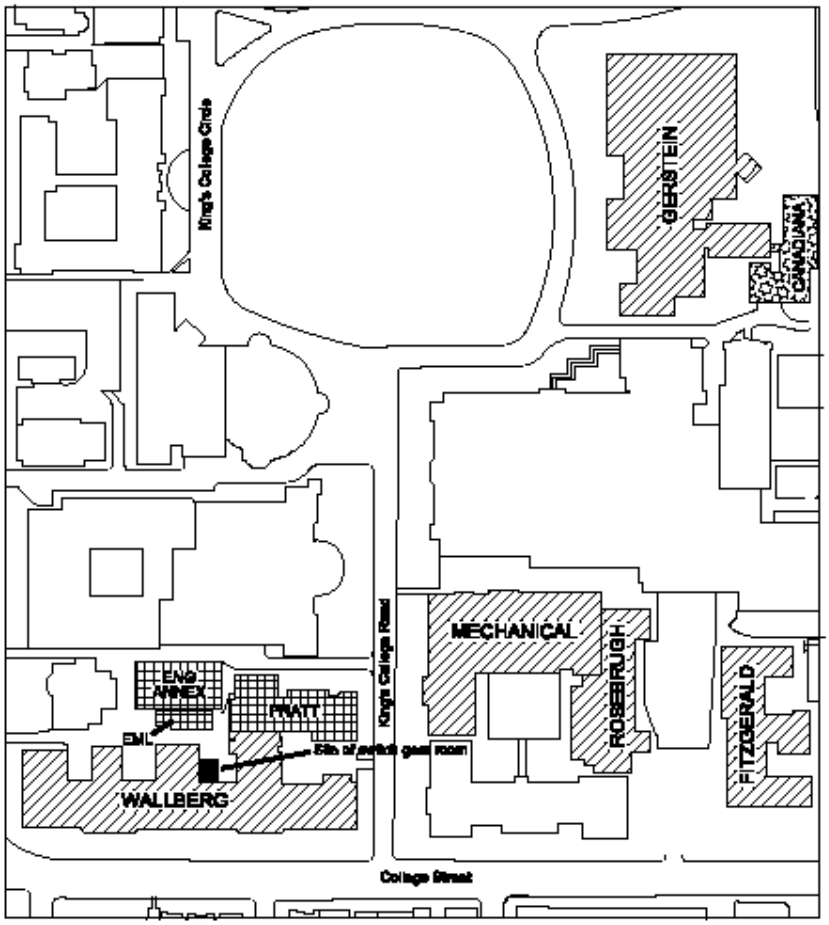
Project Title: Walberg electrical service

TABLE 1: Total Project Cost Estimates

Items		
Construction Cost - main contract	1,665,000	per LKL engineering 31 Mar 2008 (less eng fees)
Construction Contingency	199,800	@ 12%
Applicable GST	30,769	
Total Construction Costs, including taxes	**$1,895,569**	
Infrastructure Upgrades in Sector Note B	400,000	allow for THEC
Secondary Effects Note C	50,000	allow for mods at Wallberg & Pratt
Landscaping	50,000	allow for repairs
Permits & Insurance	1,000	
Professional Fees	460,000	engineering, PM
Computing Infrastructure	0	
Telephone Terminations	0	
Audio/Visual	0	
Moving	0	
Staging	0	
Furnishings: Department	0	
Furnishings: Classrooms	0	
Equipment	0	
Security & access systems	0	
Signage: Interior & Exterior	0	
Signage: Donor Recognition	0	
Groundbreaking & Building opening	0	
Miscellaneous	50,000	trades etc
Project Contingency	93,431	
Finance Costs	0	
Total Project Cost Estimate GST included	**$3,000,000**	

prepared jcb 22 Apr 2008

APPENDIX B. SITE PLAN



APPENDIX C. 200 College Street Building Envelope, Site 16