

Memorial University



**Academic Program Review of the Faculty of
Engineering & Applied Science**

Report of the External Review Panel

JUNE 16, 2014

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EXECUTIVE SUMMARY

The external academic program review panel (the Panel) for The Faculty of Engineering and Applied Science (FEAS) visited the Faculty on the 22 – 24 of May 2014. A busy schedule ensured that the Panel met a very good cross-section of the staff and students. The Panel had prepared for the meetings by reviewing the self-study document, information on the website and information derived from public data. This report describes the Panels findings primarily focused on the academic mission but also including administrative and infrastructure.

The Panel was impressed by the enthusiasm of students and staff. The academic faculty expressed some concerns about managing the rapid growth called for in their strategic plan. Some support staff pointed to the critical shortage of people to manage the students in the ever-expanding classes. None felt that the situation was unmanageable and all were confident that the necessary resources would be found. While some issues were identified, the overall view of the Panel is that FEAS is well managed, has a great talent pool and as a result is doing extremely well.

Students who were interviewed were very supportive of the educational opportunities once a program area was selected. They did point out that the attrition in first year may be due in part to the quality of teaching in certain mandatory courses. Graduate students acknowledged that research funding was excellent, their stipends less so. They are paid below NSERC rates.

The Faculty recently departmentalized and did so in a novel way. Five new departments house six undergraduate programs. A new program is anticipated for 2015. Resources are allocated to the departments based on faculty complement, student enrollment and the growth plan. FEAS chose not to departmentalize graduate studies nor many of the administrative and research functions. It is too early to comment on the effectiveness of this exercise.

Despite its guaranteed funding for growth, FEAS is saddled with some structural budgetary issues. There is a \$2M annual budget shortfall that must be made up from overhead charges, donations and special funds. As long as this exists students and researchers in FEAS will not realize the full benefit of annual external funds. They will be tithed to address the deficit.

Growth targets for FEAS call for a doubling of the student and faculty complement by 2020. Funding for this was obtained through a special provincial government initiative. There was uniform buy-in for the plan. However, some faculty expressed reservations that the numbers of faculty required could be hired in the time allocated. They also wondered if there was sufficient interest in the local population to support greater enrollment in engineering. It will be important to carefully track the quality of the education as the class sizes expand.

Research activity has increased within FEAS if one can judge by the level of funding. This has increased eight-fold in a few years. The Panel did not get a good sense of the research themes within FEAS during the interviews. In addition the Faculty web page contains limited and somewhat dated information. It was not possible for the Panel to determine the balance between industry led work and curiosity based research.

This report provides details of our findings and contains a series of recommendations aimed to improve an already good system.

1. BACKGROUND AND PROCESS

1.1 Introduction

Academic Program review is a regular, forward-looking process undertaken at Memorial to encourage academic planning in the context of the University's mission in teaching, research and public engagement. Although a hepta-annual cycle is recommended, the Faculty of Engineering and Applied Science (FEAS) was last reviewed in 2003.

Program Review is a multi-step process that includes the development of a Self-study report by the Faculty and a site visit by a panel composed of faculty external to the unit and/ or University. A three-person Panel was constituted by the Dean of Record and this report describes the findings of that Panel. The report (Report) is organized to correspond with the outline recommended for the unit's action plan that will result from the APR process. Each section of this Report represents the consensus opinion of the panel except for comments on the Biomedical program initiative from which Dr. Kendall recused himself.

The Panel extends its compliments to Dean Naterer on his leadership of the Faculty in assuring a distinctive and vibrant level of engineering activity at Memorial. The Panel was very grateful for the warm reception it received from the faculty, staff and students, a reception that made the exercise a pleasure. The Panel also is grateful to Kim Myrick for her administrative support for the visit.

1.2 Panel Terms of Reference

The overall review is referred to as the "Academic Program Review of the Faculty of Engineering and Applied Science." The Panel's terms of reference were found in the document: "*Revised Procedures for the Review of Units and Programs*" provided by the Office of the Provost and Vice-President (Academic). The document states that the purposes of the Academic Program Reviews (APR) are:

- to encourage academic planning, innovation and improvement in units and programs, in alignment with the University's mission and strategic plan
- to avail of fresh perspectives from colleagues outside Memorial
- to provide an occasion for units and programs to identify new opportunities and find ways to pursue them
- to evaluate the quality, success, and role of academic units and programs in the fulfillment of their own and the University's mission and strategic goals.

The Panel was appointed by, and reports to, the "Dean of Record." In the present case, as the Faculty was just recently departmentalized, this is Dr. Doreen Neville, Associate Vice President Academic Planning Priorities and Programs.

The document also includes guidance on the format for the review panel's report as relating to the following areas:

- Alignment with the Strategic Plan
- Undergraduate Program
- Graduate Program
- Faculty Research and Scholarship

- Faculty and Staff
- Community Service
- University Citizenship
- University Support
- Plans, Goals, and Resource Allocation

1.3 Panel Membership

The Panel had the following membership:

- Dr. Edward Kendall, Memorial University, Faculty of Medicine (Panel Chair)
- Dr. Brad de Young, Memorial University, Faculty of Science, Department of Physics and Physical Oceanography
- Dr. Michael Isaacson, University of British Columbia, Faculty of Applied Science, Department of Civil Engineering

1.4 Review Process

The Panel undertook its work on the basis of the following procedures:

- The Panel reviewed the Self-Study Report and supporting documentation prior to the visit
- The Panel visited the University on May 22 – 23, 2014. The schedule of meetings is given in Appendix I.
- Subsequent to the visit, the Panel developed a draft report based on the meetings that the Panel had held and on the deliberations amongst panel members.
- The Panel submitted a draft report to the Dean of Record, Dr. Doreen Neville on Tuesday June 10th, 2014.
- Based on feedback on the draft report, the Panel finalized the report and submitted it to the Dean of Record on Thursday June 12th, 2014.

1.5 Overview of the Faculty

Memorial University includes nine faculties, eight schools, two institutes and nearly 18,000 students located on four campuses.

The Faculty of Engineering and Applied Science is comprised of an Office of the Dean that includes three Associate Deans (undergraduate, graduate and research) and five Departments:

- Civil Engineering
- Electrical and Computer Engineering
- Mechanical Engineering
- Ocean & Naval Architecture Engineering
- Process Engineering

The Faculty offers the following accredited BEng programs:

- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Mechanical Engineering

- Ocean & Naval Architecture Engineering
- Process Engineering

At the graduate level it offers:

MEng & PhD (thesis based)

- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- Ocean & Naval Architecture Engineering
- Oil & Gas Engineering

MASc (course base; also called "premium fee" programs)

- Computer Engineering
- Environmental Systems Engineering
- Oil and Gas Engineering
- Engineering Management

These programs are supported by a complement of sixty-nine academic staff members, twenty-nine support staff and fifteen technologists. About a thousand students are enrolled in engineering over all years. The graduating class has about 180 students.

2. STRATEGIC PLAN AND MEASURES OF SUCCESS

The strategic plan of the Faculty of Engineering and Applied Science, *Vision 2020*, was developed to be consistent with Memorial's strategic plan. The pillars of the Faculty plan – Ocean Technology, Environmental and Sustainable Infrastructure, Information and Communications Technology and Energy– align very well with identified strategic areas of priority in the University plan – Arctic and northern regions; Environment, energy and natural resources: Information and communication technology and Oceans, fisheries and aquaculture.

The Faculty offers clear arguments in support of their four identified strategic areas. Ocean technology is linked to the accredited program in Ocean and Naval Architectural Engineering (ONAE), builds on affiliations with the NRC OCRE laboratory in St. John's and C-CORE and the provincial focus on the oceans sector of the economy. Environment and sustainable infrastructure builds on Faculty expertise in environmental protection and engineering systems for remediation. Information and communications technology is an existing strength of the faculty and a key economic contributor to the province. Energy is an area in which the Faculty already holds several sponsored chairs, is the recipient of major corporate investments and is a major economic driver of the province with offshore oil and gas exploration, development and transportation and with the hydroelectric development associated with Lower Churchill.

The expansion proposed by the Faculty, while happening in the context of a well-developed strategic plan, will require that the plan be updated in the coming years. Doubling the faculty complement and dramatic increases in student numbers, at both the graduate and undergraduate numbers, will change the balance and character of the faculty in ways difficult to forecast. It will

therefore be necessary to reconsider the strategic plan in the context of these significant changes. The structural reorganization will also generate the need for additional strategic planning. The newly formed departments should be asked to develop strategic plans in the coming year to help guide their own hiring and program development, since the implementation of the growth will actually take place now at the departmental level. As an example, how will the Ocean and Naval Architectural Engineering department choose to focus on ocean technology in the context of their naval architectural program?

2.1 Measures of Success

The Panel received very positive oral feedback about the student experience in FEAS. However, it was in general disappointed with the metrics presented by the Faculty to quantify their achievements and shortcomings in teaching, research and scholarly activity. Those measures provided were often in bulk form, and did not provide insight on individual programs / years. The Panel acknowledges that it was informed by several groups, notably the undergraduate affairs team, that efforts were being made to gather further data on course and student outcomes. While the numbers of students in undergraduate and graduate programs are high, and graduation rates from the senior year are impressive, attrition in the program, particularly in the first year, is high. The overall funding of the Faculty is also quite remarkable, as too is its growth in recent years; some of the signs of disquiet, in part, may be attributed to that growth.

For teaching, the Panel heard about several challenges: student retention, especially in the first year program; difficulties in attracting students into particular programs; adequate education in all areas of their program, notably writing and communication. To address possible deficiencies the Faculty needs to collect more information on student performance to enable them to better monitor the program. Given the anticipated changes in program size, it appears particularly timely to implement these metrics at once. We recommend regular surveys both of students in the programs and those in the recent post-graduation period. The Faculty could work with other groups in the university, such as CIAP and Alumni Affairs to implement these surveys.

The Panel recommends more thorough tracking of student performance.

The Review Panel did hear about some aspects of research excellence, e.g. the overall grant funding and the quality of some of the higher profile faculty, particularly those holding research chairs, but it was difficult to determine the overall success of the program relative to other engineering programs, both nationally and internationally. We were not provided with the CVs of the faculty members, nor with summary documents of the publication rates for the faculty, nor distribution of sources of funding, presentations at meetings, the numbers of faculty who sit on international panels, and the honours and awards profile of faculty members. For example, how many of the faculty hold NSERC discovery grants and at what level? The Panel recommends that the Faculty develop and implement an annual reporting of Faculty activity that is used to generate an annual summary of Faculty success and achievements.

The Panel recommends more thorough tracking of academic staff performance.

3. GROWTH PLAN

Through its *Vision 2020* strategy, the Faculty plans to undergo significant increases in its student enrolment and research capacity over an eight-year period. Table 1 summarizes planned increases in student enrollments, faculty and staff complement, and the associated operating budget of the Faculty, all relative to a baseline of 2011/12.

Table 1. Growth Plan Summary Data.

	2012	2020	increase
Undergraduate enrollments	1,100	1,600	500
Graduate enrollments	360	625	265
Faculty complement	61	101	50
Support staff	38	62	24
Operating budget	\$11.4 M	\$20.6 M	\$9.2 M

Consistent with this plan, the Provincial government's *Budget 2013* included \$1.1 M "to continue the expansion of the Faculty of Engineering and Applied Science."

The *Vision 2020* strategy (the "Growth Plan") contains details of the increases shown above, including a specific breakdown of proposed enrollment increases across the current BEng programs as well as a new program in petroleum engineering, intended faculty hires in strategic areas of specialization, and the 24 staff hires. (Graduate enrollment increases are associated with increases in the faculty complement, and so are not explicitly identified by program.) Overall, this is an impressive plan and the University and the Faculty are to be complemented on securing provincial support for it. Ultimately, it is expected to bring enormous benefits to the Province and to the provincial economy.

In implementing the Plan, the Faculty has recognized that actual enrollments will exceed enrollment targets for some programs, while they will fall short for others. As well, the Faculty intends that undergraduate enrollment increases will arise in part by increases in first year entry, by transfers into the second year programs from elsewhere and by a reduction in attrition rates, which are now unduly high.

The Faculty also recognizes various challenges associated with the Plan's implementation, including difficulties with faculty recruitment, particularly in highly specialized disciplines; difficulties with student recruitment; the need for sufficient increases in space; the adequacy of existing spaces; the need to maintain quality in the face of rapid growth; potential impacts of shortfalls in the Faculty's current budget; and changes to the Faculty's governance structure. However, the Faculty has adopted a highly flexible approach and anticipates making whatever adjustments are needed over time so as to address the various challenges as they arise.

Finally, it is noted that, although the Faculty formally approved the Plan some time ago, it will need to assure the ongoing engagement and buy-in of all its faculty members; and as well it will need to consider carefully the impact of the growth on other faculties and on other resulting demands on the University. The influx of a large number of new faculty and staff will pose many

challenges, one of which will be to ensure that the Faculty are all working towards a common strategic purpose. This reinforces a point raised elsewhere regarding the need for an active review of the strategic plan as the Faculty grows.

4. ORGANIZATION AND ADMINISTRATION

Since its inception the engineering programs have been housed within a centralized administrative unit. The Faculty has grown significantly and the growth plan calls for a sharp increase in both faculty and students. Given this the Faculty reconsidered the 2003 APR recommendation to maintain a non-departmentalized structure. The Faculty appears to have taken a novel approach to departmentalizing.

Recognizing the interdependence of their program streams, and a general wish to foster collaboration, the Faculty opted to move incrementally toward full departmentalization. Five undergraduate departments have been formed and five heads identified. Each department is responsible for delivering their specialized material to program students and to students from other programs needing courses. In addition, all departments collaborate to provide material for the first years courses required for all entrants. This activity is coordinated and supported by a first year director.

On the other hand, graduate studies remains centralized as do many administrative services such as purchasing and grants management. Maintaining a central contact for University services may be important as many faculty and administrators expressed frustration with obtaining services from the University.

At the time of review, each department head was to be provided with 0.5 secretarial support, and in principle, a budget based on the number of staff. Those interviewed indicated that financial and administrative support for Departments was a works-in-progress. Overall, the heads and the faculty in general expressed strong support for the new model, although they did query the present level of administrative support for the new departmental heads. An important cautionary note is that there is not, or the Panel was not provided, a cogent plan for addition of new faculty to the Departments. In addition, there appeared to be different concepts for implementing requirements for shared resources. Since Memorial has many departmentalized faculties, it may be instructive to examine these for best practices before settling on a course of action.

While it is too soon to determine how well this structure will function for the Faculty, they are to be congratulated for exploring this new structure.

The Panel recommends that the Dean, Associate Deans and Heads look to other departmentalized faculties for best practices in resource allocation, hiring, performance tracking and departmental administration.

5. PROGRAMS

5.1 Undergraduate Programs

The five Departments are responsible for six BEng programs:

- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- Ocean & Naval Architecture Engineering
- Process Engineering

A new program in Petroleum Engineering was approved in principle by Faculty Council. It is planned to offer this program to students in September 2015. The program will be housed within the Department of Process Engineering. The Review Panel did not see the detailed proposal for this new program development.

As with some other universities, all the BEng programs have a common first year, *Engineering One*, with a quota system for student entry into specific programs starting in second year. Thus, students rank their program choices and are placed on the basis of their first-year averages. This implies that the different programs have different minimum GPA's and different proportions of students with first-choice placements. One consequence of this is that the attrition rates are notably higher in some programs than in others.

The Canadian Engineering Accreditation Board (CEAB) has granted accreditation to all six programs until June 2017. In doing so, the CEAB reviews each program in the context of a range of criteria relating to the program and its environment. These include areas such as curriculum content and quality, admissions, degree auditing, faculty members, support staff, computing facilities, laboratories, leadership and so on. Thus, the Panel has been able to rely on the accreditation status of the programs so as to endorse their overall quality and rigour.

Nevertheless, based on student and faculty feedback, the Panel learned of some enhancements that would be desirable.

5.2 First Year Challenges

The students with whom the Review Panel met expressed great satisfaction with the overall program not only with the Co-op program, as noted elsewhere, but also with the overall undergraduate program. There are, nonetheless, signs of problems and indeed concerns raised by the students themselves. Faculty raised concerns about attrition in the first year of the program, a very striking 30%. There was discussion as to whether this is because too many students are accepted into first year and that entrance requirements are not high enough. Anecdotal evidence, however, was raised to suggest that even good students are among the 30% who leave the program in first year. The Panel heard from undergraduate students several different concerns about the first year program that suggest that there may be programmatic and structural problems that are turning away students.

Concerns were raised about the content, the approach and the instruction in the first year program. The students felt that the first year content did not sufficiently and equitably represent the alternative programs that they select for second year. For example, it was suggested that the balance and focus, e.g. between mechanical and electrical and computing, is setup in such a way that mechanics seems more exciting and rewarding relative to electrical and computing that seems difficult and uninteresting. As a result students make disciplinary choices that are ill informed and lead to them later regretting these somewhat. The programming course does not

enable students to program effectively and specifically does not teach MATLAB a platform used in the rest of the engineering program. The students felt that it should be possible to teach basic programming and a practical tool (MATLAB) in a single course that would excite student interest in computer programming.

The quality of instruction in first year seems uneven. Student comments during the interviews highlighted that careers were altered by the quality of instruction they received in this critical year. Teaching evaluation (CEQ) results made available to the Panel suggest that some of the instructors have challenges in teaching that are exacerbated perhaps by being exposed to such large groups of students who need not only good instruction but often stimulation to succeed. Given the problems with first year attrition, the first year program is where the Faculty should deploy its best instructors. A realignment of teaching and greater effort in teacher training is called for.

The Panel recommends that the Faculty carefully review its strategy in presenting first year material with respect to the apparent conflict between desired growth and high attrition.

The balance of material in the first year program seems to require a careful review and adjustment. Whether a full curriculum review is called for is difficult for this Panel to determine, but enough concerns were raised to that a thorough curriculum review be performed. In particular, the balance and relevancy of the Programming and the Engineering 1040 courses should be assayed. The Panel recommends that undergraduate students play an active role on this curriculum review committee.

The Panel recommends that a review of Semesters one and two curriculum be performed and that representatives from the undergraduate student body participate in the review.

Concerns were raised by students about the opportunities made available for technical writing. At present, the language requirements for the program include English 1080 and writing through the Co-op program. Students expressed dissatisfaction with the opportunities for developing technical writing in 1080 and noted that there was very little support for writing beyond the first year. They specifically discounted writing activities related to the co-op semesters as relevant to their training in technical writing. It should be noted that students in the Faculty of Science take two writing courses whereas students in the FEAS take only a single writing course at first year. It should be further noted that effective technical writing training is an accreditation requirement.

The Panel recommends that the Faculty review the needs of students for writing and assess whether the present course requirements and available support for students presently meet those needs.

Beyond the above enhancements, the potential introduction of a Biomedical Engineering Option in the Mechanical Engineering program deserves particular mention. The Panel noted that this is not specifically required through the Growth Plan, and suggests that the Faculty reflect on the most appropriate approach to emphasizing its biomedical engineering activity. In particular, an Option (which, from an accreditation viewpoint, implies about one semester of distinct courses) may introduce teaching inefficiencies (new, low enrollment courses); it is not specifically needed to attract female students (the Faculty already has an impressively high proportion of female students in its programs); there does not seem to be a strong biomedical engineering industry in

Newfoundland requiring such graduates; and a more rounded biomedical engineering education, beyond mechanical engineering aspects, may be preferable. Therefore, we would encourage the Faculty to consider other possibilities, such as a stream with constrained electives (that do not have accreditation constraints), or a Faculty-wide graduate program that would include aspects of electrical engineering, computer engineering, and process engineering as well and that would more directly support research needs and collaborations with the Faculties of Medicine and Science.

5.3 Graduate Programs

Graduate Programs are coordinated at the Faculty level under the Associate Dean Leonard Lye. There are no plans to devolve these to the Departments. Three streams were described: Masters of Applied Science (MASc), Masters of Engineering (MEng) and PhD.

The Faculty has shown strong growth in number of graduate students. The Panel met with a representative group (11) who expressed overall great satisfaction with their programs. They cited good interaction with their supervisors, adequate resourcing of their projects and a positive overall experience in the University and the city. It was noted by the students that the vast majority of graduate students are new to the Province. This necessitated a period of adjustment as individuals learned to cope with different educational and organizational expectations.

The MASc is designated as a premium fee program (\$26,000 for foreign students). It offers course-based educational opportunities in Computer, Environmental, Oil and Gas and Management. There are currently about 150 students and this is not slated to grow in the foreseeable future.

The goal of the MASc program is to offer advanced degrees to students who are looking for particular skills, but who do not have an interest in research. Administratively, the program was designed to operate on a cost recovery basis and to provide numerically efficient class sizes for graduate courses. Students in the program report a positive experience, and some have used it as an entry point to research-based graduate studies. At the administration level, the success of the program's cost-recovery feature is being re-examined. For example, Masters of Applied Science in Computer Engineering, Environmental Systems Engineering, and Engineering Management have been losing money and have not been cost recovery programs as initially envisaged and must be subsidized.

The research-based programs MEng and PhD collectively have about 330 students. Again, students interviewed seemed generally pleased with their experience. Some comments on access to appropriate course options for a particular research area were received. The Faculty indicated that they offer 55 graduate level classes (minimum enrollment of five) although it was not entirely clear how many of these courses were dedicated and required for the course-based masters programs. This level of graduate teaching would appear to place a significant burden on a teaching cohort of 70. The students themselves suggested solutions to expand course and lecture possibilities in the form of visiting professorships, visiting studentships and distance education. This group also expressed strong interest in internship opportunities. Internships are offered but apparently the opportunities are limited.

Some graduate students felt they lacked a clear identity within the wider context of the Faculty, including links to the undergraduates and also the aspects of professional development. In

particular they expressed interest in working more closely with the undergraduate cohort. They also felt that such interaction might encourage more local students to enter graduate studies. The Panel noted that the Faculty does not hold an annual Research Day where the work of the graduate students could be presented to both undergraduates and faculty. This is an important exercise for graduate students.

The Panel recommends that the Faculty host an annual research day.

The Panel recommends that the Faculty consider visiting professorships for small class teaching; this may alleviate the teaching abatement issue identified elsewhere.

The quality of the graduate students was difficult to assess. There is an entrance exam for the PhD program, but not for the MEng nor for the MAsc. In common with other Memorial faculties, the MEng program does not have a public defense. The Panel was not provided objective metrics such as publications, external funding and awards.

Funding for graduate studies was reviewed. The documentation provided indicated that minimum stipend levels were \$15,000 and \$16,000. This is significantly below what is offered in some other faculties at Memorial. In addition, in order to attract highly competitive students, it may be necessary to offer a premium recognizing that there are many competing positions available in industry.

The Panel recommends that the graduate stipends increase to recommended NSERC levels, and that the guaranteed stipend funding continue to be a requirement for acceptance.

5.4 Co-op Program

All the BEng programs include a mandatory co-op program consisting of a minimum of four and maximum of six work terms until graduation. The program is currently managed centrally by nine coordinators who identify placements, resolve issues, monitor student performance and make best efforts to ensure employer/ student satisfaction. All the coordinators are themselves professional engineers. They appear committed to the students and to understand the benefits of co-op education. In fact, the coordinator group we interviewed considered this program vital to the education of engineers.

The committee was impressed by the enthusiasm for the co-op program expressed by the students and the support and commitment to the program demonstrated by the co-op coordinators, dean and faculty. The co-op program is clearly central to the success of the undergraduate program and improved support for this program will be important to ensure its future success as the undergraduate student numbers grow in the coming years. There are plans to move the co-op coordinators back into the Faculty and concerns were expressed, directly by the coordinators, that they are under-resourced to deliver the support expected and to focus on client development. We heard from students that there are some gaps in the support, e.g. around visa processes for students working abroad.

Many student placements are local, but a significant number are elsewhere in North America and a few are overseas. This latter component had been supported by a now defunct provincial-government fund. Once the funding ceased, the ability to place students in countries such as Norway was greatly impeded. The coordinators report that they feel seriously under-resourced. They would like to see more invested in client visits both to develop or strengthen relationships

and to ensure a positive student experience. They expressed concerns about being able to identify sufficient placements for an expanded undergraduate program. They also mentioned insufficient secretarial support. The Undergraduate Associate Dean, Andy Fisher, indicated that the co-op program coordinators will be moving to the Faculty. A budget will come with them, but the budget is not tied to placements.

Beyond resourcing only one issue was identified. The coordinators (and to a certain extent the students) felt that some international students were not well prepared for the co-op experience. The growth plan calls for an increase in the undergraduate cohort. Depending on the strategy used this increase might mean a higher proportion of international students. The Faculty may wish to review recruitment procedures to ensure that potential students fully understand the nature of co-op education and that they may have to move to realize a suitable placement.

The Panel recommends that the Faculty review the resource requirements for the co-op coordinators and determine what is required to ensure continued success of this program.

6. RESEARCH

The Faculty has seen a remarkable increase in external research support from just under 7 million dollars in 2007 to over 17 million dollars in 2011-12. This increase in external support, in large measure from provincial oil industry funds, has been one factor in the growth of the graduate program and clearly demonstrates that the research of the Faculty is well aligned with industry.

The Panel recognizes that the Faculty has worked hard to develop a strategic plan that emphasizes research. That they have acted on the plan is evidenced by the remarkable growth in external funding. Nevertheless, there remains a need for the new departments to develop their own strategic plans that can detail their own priorities for focus and activity in the coming years.

It was noted that a significant amount of the total funding was associated with the Chevron Chair in particular. The Panel was not provided with a summary table showing the distribution of support across the research faculty but it was stated that a relatively small number of researchers receive the bulk of the research funding. Although levels of industrial research funding are very high and are impressive, the Panel noted that measures of NSERC funding held by faculty members are more modest. Some 50% of faculty members hold NSERC Discovery Grants, and the average Discovery Grant is about \$22,000 – both these measures being considered low relative to other engineering faculties across Canada. In order to sustain and enhance the Faculty's reputation for research excellence, the Panel suggests that a greater emphasis needs to be given to more scholarly research (associated with NSERC funding), and on recruiting or otherwise assuring that a few faculty members place amongst the very top of their disciplines (although admittedly the Panel did not have the opportunity to review the curricula vitae of the faculty members). A component approach towards these ends may be to require more differentiation in teaching loads, as identified in Section 9.2.

The Panel recommends that scholarly research be emphasized.

The Panel recognizes that the Departments have not had time to develop research themes. Indeed, this activity may continue to reside centrally. The Panel did note that several research

themes are described on the website. However, we were unable to determine how much of this work is high risk research and how much has a strong service (industry directed) component. To ensure a bright academic future for the Faculty it would seem important to ensure a vibrant research environment.

The Panel recommends that the Faculty prepare a landscape document describing the current research, anticipated areas of growth and the balance it wishes to achieve between service work and research.

7. TEACHING

As noted elsewhere, we heard about problems with retention in the first year program, and with some aspects of the curriculum. The recent creation of a coordinator for first year provides the opportunity to focus greater attention on the needs of first year students. As noted elsewhere, ensuring that enthusiastic teachers are involved in the first year program and adjusting the curriculum to improve the fit with the needs of the students and the program are key components for improving the first year program.

There are many good practices operating in the faculty to support the undergraduate program. The undergraduate studies committee appears to be student focused and the Associate Dean noted a number of initiatives underway to improve the undergraduate program. Their regular review of marks and student performance works well and creates awareness within the faculty of student successes, and failures. The Faculty has begun to focus on graduate attributes in preparation for expected changes in the next cycle of the accreditation process.

There is a dedicated DELTS person in the Faculty to assist instructors with the technical aspects of course preparation and delivery but we did not hear much about formalized processes to support new instructors or those who appear to be performing poorly. The Faculty is large enough to develop some of its own training activities, taking advantage of the strengths of the faculty in teaching. One option to consider would be the creation of a mentorship program for new faculty, assigning a mentor to new faculty to provide them with the support often needed to develop a successful teaching program. These mentors are used in other faculties and could also offer support for the development of the research program.

As is the case in many Memorial faculties, CEQs are used in courses in Engineering. At present these are reviewed by the Dean who provides assistance for faculty who consistently demonstrate low scores. The Dean also provides recognition for those faculty whose teaching is highly regarded by students. In future, these reviews will be made by the Department Heads, who in future will be receiving the summary CEQ reports. It is suggested that the Faculty develop an agreed approach to these assessments and the actions to be taken when poor performance is indicated. We endorse the need to provide support to those who are struggling with teaching and recognition for those who are doing very well. The need for a coordinated approach to dealing with problems may be particularly important in a shared program such as engineering, since poor performance by one instructor can have implications across the Faculty.

The Panel recommends that structured assistance be provided faculty who are struggling with teaching effectively.

We heard about the value of the Faculty's *Cahill Engineering One Help Centre* that has only been in operation for four years but seems to be very well used by students. The focus and approach to the Help Centre seems well considered. We would suggest that annual or bi-annual reviews of the Help Centre be conducted, including surveys of students, to determine the strengths of the Centre and opportunities for improvement.

8. PERSONNEL

8.1 Leadership

The Faculty's leadership group is comprised of the Dean, three Associate Deans, five Department Heads, and the Senior Administrator.

The entire leadership team appears committed to maintaining high educational and research standards as the Faculty grows. They have clearly considered various approaches to managing growth and have adopted one they feel best suits engineering. Senior management impressed the Panel with their interest in refining their practices and in supporting the mission of the department heads. The Departments appear to have a collegial approach to decision making; this will reduce friction as individual departments compete for resources.

The Dean, Dr. Greg Naterer, impressed the Panel as being particularly supportive of the Faculty's initiatives. He has chosen to focus on bigger picture funding and structural problems. He identified four key challenges as: a) the structural deficit from unfunded faculty positions (\$1.8M/year); b) the teaching deficit liability \$0.75M); c) the premium fee program budgets (deficits); d) the deferred maintenance problem (Carew and other buildings). These are commented on elsewhere in this report. In addition, he has generally identified his responsibility for fundraising and for lobbying for government and industry support.

There is a new Associate Dean of Research, Dr. Tahir Husain. The Panel was not provided a description of the position, but often ADR's play role in mentorship and support for the research activities of faculty members. This may take the form of grant-writing workshops, support for large research initiatives and vetting proposals that go to the Central Research Grants Office. Some of these functions are supported by an R&D development officer, George Rioux. Some of the functions Dr. Husain described are managed outside the Faculty, and as there are changes in organization within the office of the Vice President for Research, clarification of the focus for this office may be useful.

The Associate Dean for Graduate Studies, Dr. Leonard Lye, provided a general overview of the graduate programs, enrolment numbers and growth objectives. He appeared to be fully aware of the challenges in increasing the research intensiveness of the Faculty and described in general terms how this might be accomplished. Dr. Lye discussed various strategies for ensuring that the graduate studies experience was positive and was adequately supported. Again, the distinct role of this office was not always clear. An outline of duties of this position and its interaction with the Associate Dean for Research would be helpful.

The Associate Dean for Undergraduate Studies, Professor Andy Fisher, provided an overview of the main undergraduate streams. He discussed with the Panel the FEAS strategy for increasing enrolment and acknowledged that this might be easier for Process Engineering than for Electrical

Engineering. Nevertheless, he was confident that their growth targets were attainable, and that there would be no dilution of standards to achieve the growth. Professor Fisher indicated that additional (unspecified) efforts to retain good first year students would be undertaken in addition to enhanced recruitment.

8.2 Faculty members

The Panel met with faculty members from all five departments. Overall, the faculty members are enthusiastic, content and exhibit high standards of research and teaching.

Although faculty members broadly support the Growth Plan, this is not even across the Faculty, and the Faculty will need to assure the continual engagement and buy-in of faculty members in the Plan.

The Faculty supervises a large number of graduate students and it enjoys a high level of project funding. The Panel was not provided information on the balance between scholarly and industry-led research. Faculty members teach a minimum of two courses, with a normal teaching load of 3 – 4 courses per year. As noted in Section 9.2, a greater differentiation of teaching loads may be desirable.

The primary issue raised by faculty members relates to the need for space improvements, particularly with respect to laboratories. As well, Process Engineering identified the need for all its graduate students to be housed together.

Clearly, faculty recruitment will be a key issue as the Growth Plan is implemented, especially in more specialized areas (e.g. ocean engineering) that see relative few applicants. Thought needs to be given to innovative ways to addressing this issue, perhaps to include improvements to salaries, benefits and conditions of employment.

One aspect of faculty recruitment relates to the provision of start-up funds for new faculty. Towards this end, the Dean has improved the start-up funding arrangements that are in place. In summary, all new faculty members are now provided with \$30,000 over two years, and as well there is a high probability for one to attract \$100,000 within a year through the *IgniteR&D* Program of the NLRDC (see rdc.org). Nevertheless, given the diversity of circumstances, and the need to address the recruitment challenge, it would be helpful for some new faculty to be able to negotiate improved start-up packages, especially those at the Associate Professor or Professor ranks.

The Panel recommends that FEAS determine the competitiveness of their start-up funding prior to an aggressive hiring campaign.

8.3 Undergraduate Students

The Panel has commented on undergraduate students under Section 5 "Programs." We met with 12 students all of whom contributed comments. However, it is worth emphasizing that the students were very happy with their programs. They felt that they are being well prepared for a bright future. Interestingly, they all reported that meeting a good / engaging / passionate professor in the lower years was critical in selecting a program, or indeed deciding to stay in engineering. When asked about the transition to graduate studies, most felt that they did not

know enough about the benefits of graduate studies to make an informed decision. This suggests that student retention might be enhanced by more interaction with graduate students.

8.4 Graduate Students

The graduate students were likewise very satisfied with their programs. There were minor irritants on the salary front, but there were no complaints about insufficient research funding. As indicated earlier, this group was very interested in increasing their technical communication skills. They would like to couple specific communications education with industry internships. Some students also expressed some dissatisfaction with the range of courses available for particular programs at the graduate level.

As with the undergraduates, this student cohort felt that more interaction between undergraduate and graduate students would enhance retention and possibly increase the numbers transitioning from undergraduate to graduate studies.

The Panel recommends that FEAS consider a role for graduate students in recruitment and retention of students

8.5 Staff

8.5.1 IT Staff

The Panel met with the IT staff who are responsible for the computer labs and IT support across the Faculty. The staff complement has increased from two to five, with a new manager now in place. The manager is developing a plan for the renewal of IT infrastructure and support. For the present, these appear to be satisfactory, although of course upgrades and enhancements will be needed as the Growth Plan evolves.

8.5.2 Technologists

The technologists appeared to be highly dedicated, committed and enthusiastic, and to take great pride in their role in student education. As a result of the reorganization into departments, they now report to the Department Heads, although they continue to provide a grassroots, team-based approach in the provision of their services. They feel overloaded, there are no sick-leave back-up arrangements, and they are concerned about the potential loss of identity under the new structure. It is essential that the number of technologists is increased through the Growth Plan, and that they maintain their collaborative approach under the new structure.

The Panel recommends that the technologist/ student ratio be reviewed.

8.5.3 Administrative Staff

The panel met with administrative staff, and found them to be very capable and committed to the Faculty. As a result of the reorganization into Departments, a 50% position will support each of the five Departments (not all of these have been filled), while many administrative functions will remain with the Dean's Office. Additional staff are required, and again this is built into the Growth Plan.

There remain notable concerns with university support systems provided to the Faculty (see Section 10), and this is inhibiting the staff from carrying out their own roles in as effective a manner as possible.

8.6 Equity Considerations

Female students make up about 20-25% of the overall undergraduate student numbers, which is above many other Faculties of Engineering across the country but well below the 60% of females who make up the overall undergraduate student population at Memorial. For the years between 2008 and 2012, just over 20% of the graduating students from the Faculty were women. Amongst the Faculty' academic staff it appears that just under 15% are women although it was noted that at present none of these women occupy leadership positions within the faculty, none are heads or associate deans. It was striking that the administrative support staff was primarily female and the technical staff primarily male. In some discussions around program development, and with those working on the undergraduate studies program, there was awareness of the issue and some consideration around approaches to improve gender balance both in the undergraduate student population and the faculty. There are clearly opportunities ahead, in the hiring of staff and faculty, to improve the gender balance within the Faculty. The Dean did mention the need to groom faculty for leadership roles, a very good general approach but one that can be particularly helpful to ensure equitable opportunities for all in providing leadership and demonstrating openness and fairness within the Faculty. At times encouragement of women, e.g. by requiring them to sit on many different committees, may lead not to their encouragement but the opposite – discouragement – so that ensuring gender equity requires a careful approach in balancing opportunity and workload.

9. INTRASTRUCTURE AND RESOURCES

9.1 Budget

For the 2013/14 fiscal year, the Faculty's allocations from the University are approximately \$12 M per year for faculty and staff salaries and \$2.5 M for other operating expenditures (including teaching assistantships). This includes an increase of \$1.1 M over the prior year through the Growth Plan. In addition, the Faculty typically secures revenues of about \$2 M per year through external sources.

However, the University's allocation represents a shortfall corresponding to a structural deficit of about \$1.8 M per year, arising because of 15 faculty positions that had earlier been filled without the corresponding budget allocations. As well, there is a one-time in-kind shortfall of about \$700,000 associated with a "teaching credit deficit." That is, over an extended period faculty members have taught beyond their required teaching obligations, and so are entitled to withhold teaching that would cost \$700,000 to cover otherwise. Comments on both these challenges are provided below.

9.2 Structural Deficit

Currently, the Faculty uses its external revenues of \$2 M per year to cover the structural deficit that arises each year. This is not sustainable, and ultimately such revenues will need to be directed to their intended purposes. On the other hand, the Faculty is unable to simply forego 15

of the additional 50 positions identified in the Growth Plan, as this would not honour the University's commitment to the Province. Therefore, the Faculty and the University need to work together to consider innovative ways of addressing the issue. (The Panel does not anticipate that each Department will, in itself, be in a position to address its portion of this challenge.)

A resolution may arise by a combination of additional recurring allocations to the Faculty along with approaches to assure more efficient teaching within the Faculty. The former (additional recurring allocations) may arise from funds to cover some of the shortfall positions, and/or in more indirect ways (e.g. more complete support for the transitioning co-op budget; changes to tuition fee structures, more complete returns of tuition revenues arising from premium-fee programs, and so on). The latter (more efficient teaching) may be informed by a teaching efficiency analysis. Typically, such an analysis would entail two aspects. First, it may identify a reduction of teaching obligations through a consideration of class sizes and curricula – for example by reducing the number of low enrollment classes that are offered (both undergraduate and graduate), reducing the number of low-enrollment elective or option offerings within each program, and combining courses or portions of courses across programs. Second, it may identify approaches for more cost-effective teaching, such as through a greater differentiation in teaching loads (for example as relating to those holding NSERC grants – as occurs in some departments across Canada), a shift towards teaching-focused faculty (although promotion and tenure considerations may limit this), new hires that are term teaching positions, the development of shared courses, at both the graduate and undergraduate level, with other Faculties and a greater reliance on sessional lecturers and visiting professors.

The Faculty may also wish to consider adding faculty through joint appointments. Although the academic staff member is shared with another faculty, it is presumed that such appointments will count fully towards meeting the required provincial hiring target. If so, this approach will help retire the structural deficit since the partial rather than full cost of a new faculty member is incurred, with the balance in the new faculty salary account then be applied to the salary deficit.

The Panel recommends that FEAS and the University identify methods to reducing the structural deficit without compromising resources allocated for growth.

9.3 Teaching Credit Liability

Although this issue represents a one-time rather than a recurring shortfall, it does need to be resolved as well. The Panel was informed that sessional lecturers and reassignments will be used to retire this obligation.

9.4 Premium-fee programs

Beyond the above challenges, there is a lack of clarity with respect to the budgets and associated arrangements for the four premium-fee programs. In particular, while the Faculty indicates that program objectives are aligned with the Faculty's strategic plan, there is a need to assure that the programs are meeting their stated objectives, and to clarify the extent to which they are self-supporting or are subsidized (taking account of both direct and indirect support). The initial intent was that these were to be full-cost-recovery programs, but apparently this is no longer the case. While it may be perfectly acceptable for these programs to be subsidized, there remains a need to clarify their budgets, taking account of their revenues and their direct and indirect

expenses. Based on such an analysis, the level of subsidy, direct or indirect, will be understood and accepted and decisions regarding the evolution of the programs thereby made on a more sound basis. We understand that such an analysis is underway.

9.5 Space

The Faculty has plans for increases in space and in space enhancements associated with the Growth Plan. These include the following:

- The \$6.8 M Suncor Energy Offshore Research and Development Centre, which represents a major upgrade to a portion of the S.J. Carew Building, has recently been completed and is in the process of being occupied.
- The Core Science Facility, expected be completed in 2019, will have a portion allocated to the Faculty.
- An extension to the north of the S.J. Carew building, costing around \$20 M for laboratory space is intended, although firm commitments for this project are not yet in place.

Beyond the above projects, there are several space issues that are outstanding:

- Deferred maintenance remains a problem in S.J. Carew Building.
- The Department of Process Engineering is spread over different locations, and a consolidation of spaces is desirable. This consolidation of spaces is particularly needed with respect to graduate student spaces.
- Both faculty and students have identified the urgent need for upgrades and improvements to the laboratories.
- The Panel heard that the available of appropriately sized classrooms is proving to be a limiting factor in the growth of the BEng programs. Therefore, the construction of additional large classrooms, and/or improved access and scheduling of larger classrooms are needed.

9.6 IT

While the IT infrastructure and IT support within the Faculty appears to be adequate at the present time, upgrades and expansion, as identified in the Growth Plan, will need to occur.

10. UNIVERSITY SUPPORT AND INTERACTIONS

10.1 Central Support Units

In order to operate efficiently within the University community, certain functions are centralized so that resources can be coordinated, presumably creating efficiencies. Many of these services including road maintenance, custodial service, utilities and are delivered in the background and so do not impinge upon the mission of the Faculty. Several key services were identified as “problematic” with respect to achieving the goals of the Faculty.

First is Financial Services. The central accounts payable/receivable do not function in a usable manner. Faculty and staff “hate” interacting with the banner system. The Faculty has devoted specific resources to maintaining a parallel system so that meaningful and timely financial statements can be provided. This duplication is clearly wasteful and should not be necessary.

The Panel recommends that the University consider updating its financial management software or contracting with an outside provider for this service.

A second problem area identified by many was interaction with Human Resources. This was described as a “nightmare”, “takes forever”, much time wasted in what should be a simple process. The Panel has not determined the accuracy of these statements but notes the consistency of the comments that we heard and that the depth of frustration was real and should be addressed.

The Panel recommends that senior management determine if issues with Human Resources are limited to Engineering and take appropriate corrective action.

Third, the Panel was surprised to learn that Engineering and Applied Science funds part of a position in Facilities Management in order to ensure reasonable service. If Facilities Management is supposed to provide service uniformly across all Faculties, imbedding an Engineering coordinator would appear to confer priority. However, the Panel was not provided a policy document outlining how Facilities Management is funded, perhaps this is common practice throughout the University. From the Engineering perspective, Facilities Management should be provided with sufficient resources to achieve their mandate, it should not be the remit of a single Faculty to provide that resource.

The Panel recommends that service delivery from Facilities Management be reviewed with the aim of removing any requirement to imbed personnel.

Fourth, a number of the Faculty expressed frustration in their dealings with Research Grant and Contract Services and with the Genesis Research group. The interactions are described as: non-productive, do not enhance opportunities, create obstacles in IP management, create obstacles to research agreements, and make it difficult to get grants out the door and funding in. In summary, these offices impede faculty members from capitalizing on (primarily industry related) research opportunities. The Panel has not done an analysis of the process to determine the accuracy of these claims. However, if these problems are real it is important that the Research Grant and Contract Services and the Genesis Research groups make strong efforts to correct deficiencies as they would appear to be counterproductive to achieving not only Engineering’s mandate but the overall research mandate of the University. If the perception of Engineering is off-track or out of date, Research Grant and Contract Services and the Genesis Research group should endeavor to dispel the concern.

The Panel recommends that the Vice-President Research office investigate ways to streamline contracts management and IP oversight and dissemination.

Fifth, Engineering and Applied Science operate year round. That is there is no summer period where Faculty and students are off doing fieldwork or on summer employment. Given this, the Faculty are mystified that their cafeteria closes for the summer months. Demand from engineers will be the same as in the other semesters. Engineering shares the Carew building with Computer Science, that Department’s graduate students are also present throughout the summer. There are few places to eat on campus and the closure of this facility creates hardship.

The Panel recommends that the University reexamine its decision to close the Engineering cafeteria during the summer.

11. UNIVERSITY CITIZENSHIP

The FEAS is overall a very successful and productive unit, but the Review Panel wonders whether the Faculty is taking advantage of opportunities for collaboration and development with other groups within the university. We did not hear from any of the service departments who work with Engineering in offering the first year program and while there was a meeting with the Director of C-CORE there was nothing heard from the Marine Institute which also shares some of the same mission goals and which we did hear is proposing to cooperate around undergraduate programs in electrical engineering. It was mentioned that the Faculty is aware that the growth in students numbers will possibly have an impact on other units, and there is some funding in the growth budget to offset the associated costs for other departments, but there was no mention of a plan to ensure that other departments will have the needed resources to teach additional students who may appear there. There is very little mention of cooperative activities in the self-study report and while we did hear some examples of such activity not much was said about plans for new collaborations with others within the university.

The alignment of the strategic plan demonstrates that the Faculty is well aligned with other units of the university but such alignment is most concretely demonstrated by cooperative developments and shared activity between the Faculty and other units around the shared strategic activities. Ocean technology is a clear example of a strong alignment with the marine focus of the university and while there was some mention of the Marine Institute, there were few examples of actual cooperative activities or program development. In addition, there is much other relevant marine activity related to ocean technology in Departments like Ocean Sciences and Physics and Physical Oceanography and also in the broader sense with the Faculties of Arts and Medicine and elsewhere in programs on safety at sea and ocean sustainability. The other obvious area for which there will be common interest is in Information and Computer Technologies. Many of the departments in Science, notably Computer Science but also Mathematics and Physics and Physical Oceanography, share such a focus. As well there was no mention of the Interdisciplinary Program in Computational Science which could be a very productive partner in expanding the computational programs within the faculty. The planned growth in the coming years, with the new faculty and program activity that comes with them, should provide many opportunities to reach out to other units in the University, and beyond.

12. COMMUNITY SERVICE AND EXTERNAL INTERACTIONS

The Panel noted that Engineering and Applied Science has a number of outreach programs and supports these with an outreach coordinator. These include a summer camp program designed to expose primary and secondary school students to engineering. The Panel noted that there was a specific program for young girls.

Significant outreach occurs during placements in the co-op component. The students, coordinators, faculty and industry feedback all express mutual benefit with the co-op experience.

The Faculty has also specifically invited industry to comment on its programs. The Panel met with two members (Charles Randall, President C-Core and Gary Follett, Atlantic Director, Acuren Group) of the Engineering and Applied Science Advisory Committee (EASAC). They described the international composition of this committee and its role in both sectoral and general advisements for the Faculty. During our conversation, EASAC and FEAS jointly

expressed interest in being able to follow Engineering alumni. They felt that this would be useful for determining the effectiveness of program streams and in a general sense for fundraising. The Panel learned in talking with the Associate Vice President Academic (Dr. Doreen Neville) that the University is also interested in enhancing alumni tracking.

The Panel noted however that there appears to be little interaction with NRC OCRE in St. John's (formerly NRC's Ocean Technology Centre). This is surprising in that the NRC laboratory is well equipped for complementary large-scale testing. The Department of Ocean and Naval Architecture described financial and other barriers to effective interaction with NRC.

The Panel recommends that FEAS explore ways and means to increase collaborations with NRC OCRE and thereby capitalize on those resources.

13. OTHER MATTERS

13.1 Recommendations from Previous Review

FEAS last underwent APR in July 2003. The Faculty developed a response and action plan in the Fall of 2005. The 2003 APR Panel had provided more than thirty comments and recommendations and the Faculty responded to each. The report partitioned its comments into six areas: 1. Governance and Departmentalizing; 2. A More Pronounced Research Thrust; 3. Graduate Student Issues; 4. The Undergraduate Curriculum; 5. The Co-operative Education Format; 6. Collaboration.

It is not necessary to comment on each of the recommendations, however a few stand out. While the 2003 Panel recommended maintaining the non-departmentalized structure (Recommendation 1.1), Engineering has grown to the point where this is no longer feasible. This Panel has commented above on the novel approach to departmentalization. This new structure should address related concerns about budget, recognition and academic controls.

The 2003 Panel recommended greater collaboration with C-CORE and NRC-OTC (Recommendation 2.5). The Dean had undertaken to explore additional opportunities (action plan), but at least for OTC this has not been achieved by 2014, perhaps due to restructuring within NRC.

The 2003 Panel (Recommendation 4.2) suggested that CIAP be asked to conduct a study of student success as a function of grades on admission after Term B. The results of this study should be the basis for future decisions regarding admission standards. The Faculty agreed with this recommendation but undertook to perform this function internally. The goal was to “determine admission standards for the Engineering 2010 programs”. The success of this undertaking is questionable since attrition remains remarkably high in semesters 1 and 2. This Panel was not provided specific information on adjustments to admission standards to improve performance, therefore it is unclear if this action was completed.

The 2003 Panel noted that the work term offers a great opportunity to develop writing skills (recommendation 5.3). However, during the current process (2014) students report that writing skills development is not a priority during work terms, just getting it done was the priority! The students requested that a technical writing course be offered that would prepare them for the work term writing tasks.

In general the 2003 report was positive and noted the substantial success of FEAS. Many of the recommendations were acted upon to good effect and those outstanding are recalcitrant issues involving the collective agreement, infrastructure, and university services.

13.2 The APR Process

The APR process was interesting and provided a snapshot of many of the critical elements of FEAS. As panelists the goal is to provide objective comment on the scope, alignment and feasibility of the academic goals of the Faculty. The data collection part of the task is accomplished with some background reading including the University Strategic Plan, Faculty Strategic Plan and a previous APR. Not included were performance statistics for the members of the faculty, student success rates, comparisons with other engineering faculties and details of the research funding currently held.

As a result this Panel offers the following recommendations to improve the functioning of the committee.

1. Provide more detailed background information. Include as much relevant documentation as possible (especially descriptive grant information and CV's). Panel members should arrive informed of the status quo and can then direct their questions appropriately.
2. FEAS and possibly the University should develop an ongoing measures of program success. This should include exit interviews with students and 1 – 3 year alumni.
3. The objectives for exit interviews are unrealistic given the busy schedule. Reviewing a faculty management group and five departments in two days may not be practical. Adjust the schedule to allow more work time for the panelists.
4. The APR panel should be provided secretarial support. Having one or more panelists taking or typing notes detracts from that individual's ability to participate fully in the interviews.

14. RECOMMENDATIONS

14.1 General Recommendations

- a. UGP: Address the problem of “good-student” attrition in the first year. Consider using more charismatic instructors and ensuring that the curricula of 1020 and 1040 are fresh and meaningful.
- b. UGP: Finalize co-op administration reorganization. Encourage coordinators to focus on identifying placements. Continue with co-op as mandatory (4 semesters) ensure that there is support for 6 semesters if that is what the student needs.
- c. UGP & GP: Enhance technical professional communications for both undergraduate and graduate students. Especially at the graduate level provide advanced training on corporate and technical communication.
- d. FEAS: Develop and implement productivity measures for faculty teaching and research.
- e. FEAS: Document the roles of Departments, and the roles and responsibilities of the leadership team (FMG).
- f. FEAS: While doing great on research funding, need to emphasize scholarly research, as evidenced for example by NSERC funding, and more high fliers; need to diversify funding beyond industry.
- g. FMG: Address the salary deficit jointly with University administration without hampering growth.
- h. FMG: Monitor the growth plan for alignment with the strategic plan
- i. FMG: Clear the teaching deficit liability
- j. FMG: Review Premium fee program budgets. Ensure these programs are meeting the objectives for which they were designed.
- k. MUN: Address deferred maintenance in the Carew building
- l. MUN: University support systems need to be user-friendly and responsive, including research office, HR, finance, maintenance, and food services.
- m. MUN: Genesis IP approach was a noted obstacle; need to review the policy to make it more friendly to companies and faculty members.

14.2 Specific recommendations by section

Section 2.1 Measures of Success

- ... more thorough tracking of student performance.
- ... more thorough tracking of academic staff performance.

Section 4. Organization and Administration

... the Dean, Associate Deans and Heads look to other departmentalized faculties for best practices in resource allocation, hiring, performance tracking and department administration.

Section 5.2 Undergraduate Program First Year challenges

- ... the Faculty carefully review its strategy in presenting first year material with respect to the apparent conflict between desired growth and high attrition.
- ... review of Semesters one and two curriculum be performed and that representatives from the undergraduate student body participate in the review.
- ... the Faculty a review of the needs of students for writing and to assess whether the present course requirements and available support for students presently meet those needs.

Section 5.3 Graduate Programs

- ... the Faculty host an annual research day.
- ... the Faculty consider visiting professorships for small class teaching; this may alleviate the teaching abatement issue identified elsewhere.
- ... the graduate stipends increase to recommended NSERC levels, and that the guaranteed stipend funding be a requirement for acceptance.

Section 5.4 Co-op program

... the Faculty review the resource requirements for the co-op coordinators and determine what is required to ensure continued success of this program.

Section 6. Research

- ... that scholarly research be emphasized.
- ... the Faculty prepare a landscape document describing the current research, anticipated areas of growth and the balance it wishes to achieve between service work and research.

Section 7. Teaching

... structured assistance be provided faculty who are struggling with teaching effectively.

Section 8. Personnel

... FEAS determine the competitiveness of their start-up funding prior to an aggressive hiring campaign.

... FEAS consider a role for graduate students in recruitment and retention of students
 ... the technologist/ student ratio be reviewed.

Section 9.2 Structural deficit

... FEAS and the University identify methods to reducing the structural deficit without compromising resources allocated for growth.

Section 10 University Support

... the University consider updating its financial management software or contracting with an outside provider for this service.

... senior management determine if issues with Human Resources are limited to Engineering and take appropriate corrective action.

... service delivery from Facilities Management be reviewed with the aim of removing any requirement to imbed personnel.

... the Vice-President Research office investigate ways to streamline contracts management and IP oversight and dissemination.

... the University reexamine its decision to close the Engineering cafeteria during the summer.

Section 12 External interactions

... FEAS explore ways and means to increase collaborations with NRC OCRE and thereby capitalize on those resources.

Section 13. Other Matters – the APR process.

The Panel found it had to scramble for information relating to certain aspects of this review. As a result the following recommendations are offered:

1. Provide more detailed background information. Include as much relevant documentation as possible (especially descriptive grant information and CV's). Panel members should arrive informed of the status quo and can then direct their questions appropriately.
2. FEAS and possibly the University (CIAP?) should develop an ongoing measure of program success. This should include exit interviews with students and 1 – 3 year alumni.
3. Reviewing a faculty management group and five departments in two days may not be practical. The schedule should allow more work time for the panelists, especially prior to the exit interviews.
4. The exit interviews appear to have limited value when panelists have little time to process and prioritize their findings.
5. The APR panel should be provided secretarial support. Having one or more panelists taking or typing notes detracts from that individual's ability to participate fully in the interviews.

APPENDIX I – REVIEW PANEL SCHEDULE OF MEETINGS

		FACULTY OF ENGINEERING AND APPLIED SCIENCE Academic Program Review Site Visit Itinerary May 21 - 24, 2014		
Wednesday, May 21st, 7:00 PM, Bacalao Restaurant, 65 LeMarchant Road Dinner Meeting - Panel Members meet with Associate VP (Academic) / Dean of Record, Dean of School of Graduate Studies, APR Coordinator				
Thursday, May 22 nd Room: EN-4002		Friday, May 23 rd Room: EN-4002		Saturday May 24 th
8:30 AM	Organizational Meeting: Panel Members and APR Coordinator, Kim Myrick	8:30 AM	Organizational Meeting: Panel Members and APR Coordinator, Kim Myrick	Panel: Draft Report Room: EN-4002
9:00 AM	Dean, Faculty of Engineering and Applied Science – G. Naterer	9:00 AM	Associate Dean, Undergraduate Studies – A. Fisher Chair of CUGS Committee – G. George	
9:30 AM	Tour of Faculty with Dean and Department Heads	9:30 AM	Undergraduate Students	
10:30 AM	Department of Civil Engineering - Faculty Members	10:00 AM	Graduate Students	
10:30 AM	Department of Electrical and Computer Engineering - Faculty Members	10:30 AM	Senior Administrative Officer – B. Elliott	
10:50 AM	Department of Mechanical Engineering - Faculty Members	11:00 AM	Engineering Department Heads – B. Colbourne A. Hussein F. Khan N. Krouglicof D. Peters	
11:10 AM	Department of Ocean and Naval Architectural Engineering - Faculty Members			
11:30 AM	Department of Process Engineering - Faculty Members			
11:50AM	Panel Lunch with Dean and EASAC Members – G. Follett and C. Randell (Bitters)			
12:15 PM	Associate Dean, Graduate Studies – L. Lye	12:00 PM	Panel Lunch with Dean	
1:45 PM	Members of Committee on Graduate Studies and Chairs of Boards of Studies	1:30 PM	FLEX TIME	
2:15 PM	Associate Dean, Research – T. Husain	2:00 PM	Panel Confers for Exit Meetings	
2:45 PM	FLEX TIME			
3:15 PM	Staff – Lab Technologists, ECS			
3:30 PM	Staff – Administrative, Professional, Managerial	3:30 PM	Exit Meeting with Dean of Record – D. Neville (Panel Shares Preliminary Findings)	
4:00 PM	Co-op Coordinators	4:00 PM	Exit Meeting with Dean, Faculty of Engineering – G. Naterer (Panel Shares Preliminary Findings)	
4:30 PM	Suggested Time for Panel to Confer	4:30 PM	Exit Meeting with Unit - Dean, Dept. Heads, Faculty, Students, Staff (Panel Shares Preliminary Findings)	
5:00 PM	Working Dinner for Panel to Discuss Meetings and Report Writing	5:00 PM	Suggested Time for Panel to Confer	
7:00 PM		7:00 PM	Working Dinner for Panel to Discuss Meetings and Report Writing	