SCHULICH SCHOOL OF ENGINEERING UNIT REVIEW
Summary Report

The Site Visit of the Unit Review Team to the Schulich School of Engineering took place on June 23-24, 2022. The Unit Review Team consisted of:

- Dr. Melissa Boyce, PhD. – Associate Dean (Undergraduate Programs and Student Affairs), Faculty of Arts, University of Calgary
- Dr. Marcia Friesen, PhD., P.Eng. – Dean, Price Faculty of Engineering, University of Manitoba
- Dr. Ishwar K. Puri, PhD., P.Eng. – Vice President – Research, University of Southern California
- Dr. Deborah Roberts, PhD., Eng. L. EGBC – Dean, Faculty of Science and Engineering, University of Northern British Columbia

Following the Site Visit, the Unit Review Team prepared a written report containing comments and recommendations. A short response to each recommendation has been provided. General comments and the recommendations and responses follow.

To facilitate the SSE's response to the broad recommendations given by the unit review committee, input was sought from SSE Department Heads, Associate Deans, and senior staff members. The response will also be presented at an Engineering Faculty Council meeting in the Fall 2022 academic term.

GENERAL COMMENTS OF THE UNIT REVIEW TEAM (SELECTIONS FROM REPORT)

The SSE is home to over 5000 students, nearly 200 academic staff, and an administrative and technical support team of 80. The SSE is led by a Dean, Vice-Dean, and seven Associate or Assistant Deans. Two portfolios were created in the last two years. The review team noted strong representation of women and racialized persons among department heads and associate/assistant deans. Along with department heads and portfolio leads, there is a significant allocation of faculty resources to administrative leadership. That is to say, the SSE appears to have a sufficiently robust leadership structure. Stakeholders spoke positively about their ready access to leadership when needed.

Over the course of two days, the review team met University of Calgary leaders and the Schulich School of Engineering (SSE) dean and vice-dean, associate and assistant deans, department heads, portfolio leads & faculty representatives in teaching & learning, student experience, Indigenous Knowledge, EDIA, and graduate programs & research. The team also met with undergraduate and graduate students, administrative, technical, and professional staff, and deans of two collaborating Faculties. The review team received a 2022 self-report by the SSE (33 pages), access to University-level plans in a range of areas, and five-year data from the University's Office of Institutional Analysis.

The review team found the conversations and observations over the course of two days to be consistent with the written self-report of the SSE. Further, we applaud the authentic self-reflection and the forward focus expressed in all of these documents and interactions.

We found the SSE to be a leader in experiential learning, exceeding what peer institutions have been able to do while recognizing future opportunities yet to be implemented.

The review team noted a strong commitment to a holistic view of student success ranging from teaching & learning and curriculum, student wellness, EDIA, decolonization, and leveraging engagement with institution-level strategies and initiatives.

The review team celebrates the remarkable growth in research revenue to researchers over the past five years and affirms the efforts to support and expand the graduate programs with these resources. The review team was very impressed with the culture established in the SSE

Structure and governance:

The review team noted strong representation of women and racialized persons among department heads and associate/assistant deans. Along with department heads and portfolio leads, there is a significant allocation of faculty resources to administrative leadership. That is to say, the SSE appears to have a sufficiently robust leadership structure. Stakeholders spoke positively about their ready access to leadership when needed.

Staffing and Personnel:

Of note in the SSE self-report is the faculty hiring wave, with the SSE having hired 30 new faculty members since 2019. This leads to a large contingent of early-career, pre-tenure faculty, and the changing gender balance in the professoriate over time toward more female representation.

A key priority for the SSE has been communicating on both the perception and reality of technical services availability and organization. Technical staff reported that, overall, their workload was manageable within the new mandate as of January 2020, assuming there are no extended vacancies among the team. The SSE is in the process of hiring seven technical staff to double the current contingent, which the review team views as a needed asset to its programming.

Undergraduate academic advising is a hybrid of shared services with some departmentalized functions. Six undergraduate advisors support 4200 undergraduate students (1:700) with two additional advisors performing specialized roles for the SSE. Advisors report that, overall, their workload was manageable, although requiring a constant balance of service expectations and with limited time to be proactive in new initiatives.

We recommend that the School examine this matter critically to understand the existence of potential gaps that constrict research and teaching.

Programming:

Overall, the following SSE student profile is well-aligned with the Canadian university landscape of engineering schools.

Retention to second-year programs is high (>95%) and graduation rates are consistently above 85%.

With an eye to emerging industry directions and needs, the SSE is developing programming into new areas beyond its traditional reputation of oil and gas engineering and into sustainable energy, clean tech, and software. After a common first year, 99% of students are successful in being offered their

preferred program spot (and the exception is the very popular software engineering program, which was recently identified for expansion with targeted provincial funding).

The review team found the SSE to be a leader in experiential learning with impressive facilities upon which to ground a cohort-based, experiential curriculum and with recognition of the staff needed to fully develop the potential of this approach. The review team noted the collective spirit of willingness to engage and try new ideas and positive outlook among program stakeholders.

Research:

In the SSE self-report and during the site visit, the numbers (2021/2022) were reported during the site visit as 875 thesis-based M.Sc. and Ph.D. students and 900 M.Eng. students. Approximately two-thirds are international students. Time-to-completion averages are very healthy: 4.5 years for Ph.D., 2.4-2.5 years for M.Sc. and M.Eng.

The SSE's self-report states that external competitive funding has increased by more than 70% per researcher in the five years ending 2022, with a steady increase in the total value of NSERC partnership grants year over year.

Researchers' impact as measured by citations is strong, with a Field-Weighted Citation Index typically between 1.2-1.5 and an average of four publications/tenure track faculty annually. Currently, there are 19 research chairs (two in recruitment) that bring profile to the school and vice versa.

Research is supported by a research facilitator, professional writer, and a newly established effective partnership with Innovate Calgary's Industry Liaison Office.

Resources:

In late 2019 / early 2020, the provincial operating grant was reduced by an amount that represented a 18% cut to the University's operating budget. This translated into a $12M cut to the SSE in base cuts and inflationary costs since 2019.

The SSE leadership recognized this possibility in 2019 or earlier and began to plan accordingly. While the cuts in January 2020 were noticeable and painful, the review team considers the SSE to have taken a strategic and defendable approach to managing this situation.

Of note, the COVID-19 pandemic began in March 2020, and notwithstanding the budget pressures, the SSE took courageous and financially significant steps forward to renew their facilities toward a reimagined first year experience for students in a cohort model based in experiential learning, including an emphasis on spaces to build community and support well-being.

The review team supports that within the SSE, the budget at the departmental level is "activity-informed" rather than strictly activity-based, allowing the SSE to advance strategic priorities and respond to trends over time.

Facilities and Infrastructure:

several challenges were identified, including no dedicated space at present for the Biomedical Engineering Program, constraints on graduate student study space, and some renovated spaces that nonetheless don't serve modern teaching approaches.

Partnerships:

Community engagement with industry partners suffered when modality was limited to Zoom during the pandemic.

The intentions to augment the development staff seem very appropriate and necessary. Finding talent is a key driver for corporate partners to engage with the SSE.

Summary:

We thank the University of Calgary and the Schulich School of Engineering for the opportunity to engage in this review, to meet with stakeholders, and to examine the school. We appreciate and affirm the spirit of transparency and authenticity we experienced in all of our interactions. We believe the SSE is aspiring to be best-in-class and that it is excelling in a complex environment.

REVIEWER RECOMMENDATIONS AND UNIT RESPONSE FOLLOW-UP

1. Programs & curriculum:

1 *Graduate Studies: To further enhance the student experience, especially for students in small departments and students in areas on the boundary of two or more disciplines, we recommend that the SSE examine the potential harmonization of graduate program administration to a central graduate student office for student advising and student life, rather than departmentalized offices. This may warrant an iterative and/or staged approach, in which the specific administrative aspects which are harmonized grow over time and/or harmonization is piloted with two or three departments, respectively.*

This goal entails a review of graduate program requirements and regulations for alignment across the SSE, balancing goals of equity in student experience with the need to address unique program needs and program integrity.

The review team recommends further examination of a core set of course offerings for graduate students, particularly M.Eng. students, to facilitate meaningful programs by expanding offerings and addressing redundancy.

SSE Response:
We will initiate a review to examine potential harmonization of graduate program administration. We will ask that the Faculty of Graduate Studies and the Graduate Student Association be engaged in the process to provide suggestions and assist with the conversation with SSE internal stakeholders. This process will include examining norms in other

departmentalized Faculties at the University of Calgary.

We will examine opportunities to harmonize graduate program requirements and regulations across the Faculty. This process will include examining norms in other departmentalized Faculties at the University of Calgary.

We agree with the value of offering a core set of graduate course offerings. We currently have a limited set of core courses, and will explore expanding this set.

In addition to academic actions, we have now helped re-create a Schulich Graduate Student "Association" and opened a dedicated graduate student homeroom space for students to collaborate.

1.2. *CEERE: We recommend an internal review of the structure and governance of the CEERE with respect to its mission, programming, administration, quality measures etc. In this review, we encourage a willingness to consider a transition or closure of the program*.

SSE Response:
We will initiate a formal review of CEERE (Centre for Environmental Engineering Education & Research).

1.3. *Sustainability Systems Engineering: We recommend that the Sustainability Systems Engineering program is structured as a Faculty-level initiative rather than a department-level or departmentalized initiative, as the latter is counterintuitive to the subject matter. We recommend structuring Sustainability Systems Engineering as a unit that has the ability develop academic programming for sustainability education, research, and outreach. Toward this end, we encourage a broad-based discussion within the SSE and with University leadership.*

SSE Response:
We are in the HR process of appointing an Interim Associate Dean – Sustainability Engineering, so that academic programming and collaborative research in this field do not sit within a department/centre but are cross-cutting across SSE. We will create an equivalent of a Department Council for SSE academic members who are working in this area to build an interdisciplinary community.

1.4. *International student enrolment: The review team recognizes the imperative to increase international student enrolment and recognizes that current enrolment (% international students) is consistent with other Canadian engineering schools. With a budget that derives approximately half of its revenue from tuition, we highlight the risks associated with relying on significant enrolment by international students.*

SSE Response:
As part of our ongoing budget process, we will ensure we have reasonable mechanisms (for

example, mechanisms that do not involve changes to our staff complement) to manage potential short- and medium-term variation in enrolment funding.

2. Growth in a challenging financial environment:

2.1. *Administrative staff: Currently, administrative staff appear to be working at capacity with no contingency for unexpected or prolonged absences. We encourage further cross-training and team-based structures, as well as adding capacity where needed and when possible.*

SSE Response:

We will continue to develop cross-training opportunities. As part of our 2023-2024 budget submission, we will seek to increase capacity, especially in departmental units that have grown in recent years. We are committed to continuing to assess administrative workload and strategically add positions to support teams, focusing specifically on the academic departments and what support is required post-COVID.

2.2. *Technical services: While the shared services model has asked for adaptability from faculty and staff, we believe the shared service model will benefit the SSE. We recommend a continuation of ongoing transparency and dialogue to address faculty and staff perceptions and to manage expectations around technical support in undergraduate teaching labs and in research support.*

SSE Response:

The shared service model for Technical services has created a successful technical team, where we focus on supporting student experiential learning wholistically. The change from departmental technical support, to a central faculty support, with increased technical team members has enabled cross functional training, new experiences for employees and a broader support for students. There is an opportunity for increased dialogue between technical services and faculty members, to ensure that the technical support is understood. This dialogue will be driven by the new Technical Services Manager engaging deliberately with departments to increase transparency. We have also expanded research support through a new research machinist position, and two approved research scientist positions.

2.3. *Space and facilities: Understanding that space tacitly shapes culture and student experience and as plans for student and faculty growth are operationalized, we encourage a balanced approach to program commitments relative to having both enough and appropriate space. For the Biomedical Engineering Program, space is an immediate priority to help establish a sense of cohesion and definition for the program.*

SSE Response:

We have approved a space plan for Biomedical Engineering. Because of financial constraints, renovations will proceed gradually. Priority will be given to creating required co-located faculty offices, undergraduate laboratory space, and graduate student / computer simulation labs. This will be followed by shared "wet" research laboratory space and dry research laboratory space as financial resources for renovations allow.

We will continue to seek opportunities to renovate space, to expand the utilization of existing resources.

Because of the significant enrolment increases, space availability is a significant challenge for the Schulich School of Engineering. Student enrolment expansion alone in the Schulich School of Engineering over the last 5 to 7 years is greater than enrolment numbers of some entire Faculties at the University of Calgary.

2.4. *Graduate student study space: To address space constraints in an equitable way, we recommend consideration of different models of allocating graduate student study space, including but not limited to centralized (vs. departmentalized) study space assignments, hotdesking, and FIFO lists with time limits on entitlement to space based on nominal program length.*

SSE Response:
We are committed to developing different models of allocating graduate student space. We are open to using different models, including centralized vs. departmentalized workspace assignments, hotdesking, and FIFO lists with time limits on entitlement to space based on nominal program length. We are assessing space utilization, with a clear understanding that space is critical for students. This responsibility will be assigned to our Director of Operations and Department Managers.

2.5. *Support new faculty integration in a period of rapid faculty growth weighted toward a high proportion of early career, pre-tenure faculty, and within an environment of potential losses to community due to Covid, we recommend an intentional emphasis on research mentoring to enable early-career research momentum through departmental as well as school-level cohort mentoring. We recommend that mentoring inherently navigate people's identities, allowing them to express who they are and want to become as a person and as a faculty member within the SSE.*

SSE Response:
We will review and expand our current mentoring program to address this recommendation. This will be part of the responsibilities of our Associate Dean – Equity, Diversity, Inclusion and Accessibility.

2.6. *Development: Friendraising precedes fundraising, and both require personal relationships. We encourage the SSE to continue with plans to augment the staff in the development portfolio.*

SSE Response:
The SSE development portfolio has recently increased from 1 person to a small team of 3. This is still below levels from 8 to 10 years ago. As part of the 2023/2024 budget process, we will explore the potential to expand our development portfolio. We will also explore ways that other SSE staff could support development activities.

3. EDIA and Indigenization:

3 ***We recommend that EDIA initiatives engage male allies in meaningful ways*** *with both voice and accountabilities to develop, champion, implement, and lead initiatives. It is critical to allow equity-deserving groups a voice and safe space to express their experiences and their vision for the future. At the same time, it is important to recognize that equity-deserving groups cannot shoulder the responsibility of equity-seeking initiatives alone, since equity is fundamentally a power issue and the traditional powerholders must be engaged champions.*

SSE Response:

We completely agree. A review of our EDIA committee structure and membership will be completed in addition to creating other opportunities for allies to be engaged in EDIA initiatives. This will be led by our Dean, Vice-Dean, Associate Dean EDIA, and Director of Operations.

3 *We noted sincere and multi-faceted approaches to Indigenous Knowledge integration and decolonization in the SSE within meaningful goals and meaningful institutional efforts. Many of the activities are still pending or have only recently begun. We affirm the vision and we encourage ongoing commitment to these initiatives.*

SSE Response:

We are committed to increase our efforts and resources to support Indigenous Knowledge integration and decolonization within the Schulich School of Engineering. Our first step will be implementing clear academic leadership for our Indigenous initiatives, and an organizational structure to ensure SSE faculty, staff, and leaders are engaged, connected, and supporting these initiatives. Responsibility for these steps will lie with the Dean, who will work in partnership with our Indigenous faculty members and allies, the Vice Provost and Associate Vice President-Research (Indigenous Engagement) and the leadership of the Writing Symbols Lodge.

*4. **Pathways to potential futures:** The SSE can envision many possible futures, each of which engage transdisciplinarity and can engage opportunities in its environment. These include, but are not limited to*

4 *Quantum information science, and its engineering applications;*
4 *Precision health, partnering with the Cumming School of Medicine and others to establish this as an institutional priority, and leverage the Province's support for software engineering.*
4 *Infusing digital space into all engineering disciplines, engaging with the growth of tech in the city and province, addressing needs for talent, and enhancing graduate readiness for engineering practice.*

SSE Response:

We agree that these are important areas for future focus. Our updated strategic plan, which will be finalized in early Fall 2022, includes a number of cross-cutting areas that cut across Research, Academic Programs, and Community Engagement. Quantum Science and Digital Technologies, both fit in our

"Hyperconnected World & Our Digital Future" area, and Precision Health fits into our "Health & Wellness" area.

Further:
  i) We will continue to explore ways to infuse digital "space" into all engineering disciplines by appointing an academic director for Digital Engineering (responsible for supporting interdisciplinary Research, Scholarship and Academic Programming in Digital Engineering) 9
  ii) We are current in the final stages of recruiting 2 new faculty members in Quantum Science and Technology, and are finalizing/seeking further resources to recruit 3 to 5 additional faculty member in this area over the next 2 years. Instead of forming additional academic leadership roles in SSE related to Quantum, we will seek an opportunity to have an engineering leadership role within the University of Calgary Quantum City initiative.
  iii) Our Department Head for Biomedical Engineering / Director of BME Calgary will be tasked to consider if our current strategic plan area of "Health & Wellness" should be updated to more clearly indicate a strong link to Precision Health.

Reporting on Recommendations and Follow-up

The Review Team recommendations will be revisited mid-way through the cycle. At that point, the Schulich School of Engineering will report on its status in acting on the recommendations, providing explanations and timelines for those which have not been met. This interim report should be submitted to the Provost in December 2024, with the next full review scheduled in 2026-27.