NSERC Discovery Grants Workshop

Jim Cotton

- Professor in Mechanical Engineering – 16 years

  Industry: Dana Corporation – 7 years
  - Applied Research in Integrated Energy Systems, waste heat recovery (Pizza Ovens), thermal storage and (automotive) thermal management
  - Discovery Research:
    - “Electrohydrodynamically Controlled Phase Change Heat Transfer and Thermal Storage Systems”
- NSERC Discovery Evaluation Group 1512 -Mechanical
- Evaluation Committee Member 2017 – 2019
- Committee Co-Chair 2018 & 2019

Discovery Grants Program Specificities

Discovery Grants Program	Other 'Typical' Research Support
▪ Funds **programs** of research	▪ Funds research **projects**
▪ Freedom to pursue most promising avenues	▪ Constrained by objectives set in proposal
▪ Covers direct costs of research; not faculty salary or overhead	▪ Covers direct and possibly indirect costs and some salary
▪ Typically 5 years duration	▪ Project-based timeframe
▪ Limited to one DG at a time	▪ Multiple grants can be held at one time

Source: NSERC Orientation Session

Discovery Grants Statistics

Table 1 Overall Comparative Statistics Discovery Grants Competitions, 2015-19

	2015		2016*		2017		2018*		2019	
	Success Rate	Average Grant ($)	Success Rate	Average Grant ($)	Success Rate	Average Grant ($)	Success Rate	Average Grant ($)	Success Rate	Average Grant ($)
Early Career Researchers (ECR)	65%	$26,120	75%	$28,771	69%	$25,409	64%	$29,599	57%	$30,008
Established Researchers (ER)	65%	$32,903	65%	$37,138	66%	$34,948	67%	$40,355	71%	$40,071

*Includes additional funding received resulting from Federal Budgets 2016 and 2018

Source: NSERC **2019 Competition Statistics**

Evaluation Materials

- Application
- Canadian Common CV (CCV)
- Samples of Research Contributions
- Reports from external reviewers

What reviewers look for:

- Evidence of researcher accomplishments and quality of work
- Evidence of the specific application of knowledge and improvements to current practices (e.g. revisions to codes)
- Evidence of the creation of novel products, processes and services that are or may become useful to society (e.g. software development, technology transfer, patents)
- Evidence of degree of innovative content of the research program and the potential to make a significant contribution to the field
- Evidence that HQP will receive high quality research training and that past students have highly desired skills and are needed/wanted in the Canadian workforce

Application Sections

Application - Part 1

- Identification
- Summary of Proposal
- Proposed Expenditures
- Relationship to Other Research Support
- HQP Training Plan
- Past Contributions to HQP
- Most Significant Contributions
- Additional Info on Contributions

Application - Part 2

- Proposal
- List of References
- Budget Justification

Canadian Common CV Sections

- Personal Information
- Education
- Recognitions (Honors, Prizes, Awards)
- User Profile (Research Expertise)
- Employment (Academic, Non-Academic)
- Research Funding History
- Supervisory Activities
- Administrative Activities (Editorial, Event Administration, Collaboration, Technology Transfer)
- Memberships
- Contributions (Journal Articles, Conferences, Presentations/Invited Talks, Books, Patents)

Evaluation of a Discovery Grant Application

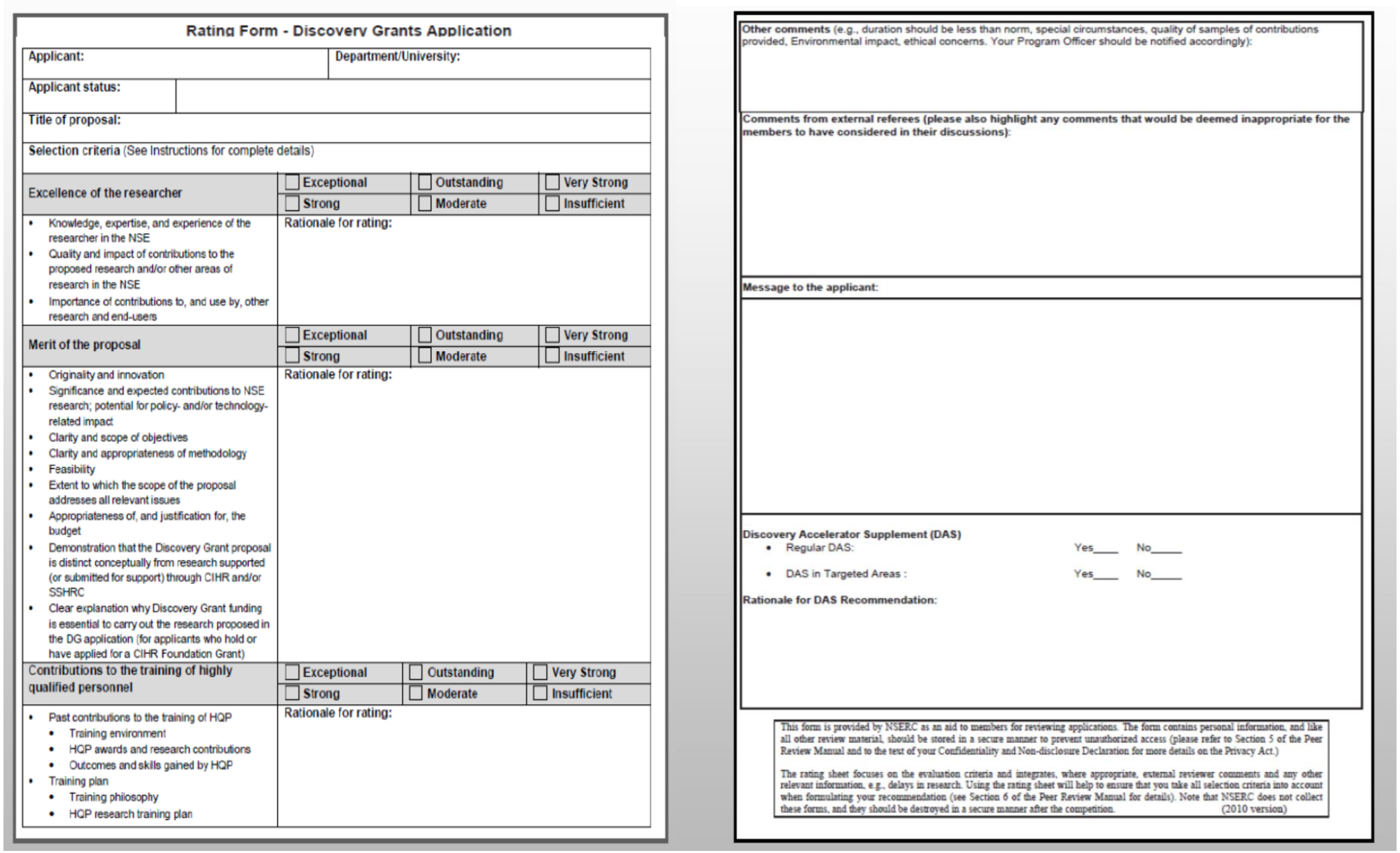
- Each Committee member reviews 40 to 50 applications each year. Each application takes about 3 hours to review and then another 15-30 minutes at the competition

- Each application will be assessed by 5 members, the assignment of applications is typically:
  - First Internal Reviewer (10-15 applications each)
  - Second Internal Reviewer (10-15 applications each)
  - +Three Readers (20-25 applications each)

External Reviewers Reports

- External reviewer reports start to arrive in January and can arrive up to the week of competition.
- NSERC Evaluation Committee Member will integrate external reviewer reports into their evaluation. However, given the amount of work, most start reviewing in December before they have the external examiner reports and then integrate the reviews later.

Rating Form



Rating Form - Discovery Grants Application

Applicant:	Department/University:		
Applicant status:			
Title of proposal:			
Selection criteria (See Instructions for complete details)			
Excellence of the researcher	☐ Exceptional	☐ Outstanding	☐ Very Strong
	☐ Strong	☐ Moderate	☐ Insufficient
• Knowledge, expertise, and experience of the researcher in the NSE • Quality and impact of contributions to the proposed research and/or other areas of research in the NSE • Importance of contributions to, and use by, other research and end-users	Rationale for rating:		
Merit of the proposal	☐ Exceptional	☐ Outstanding	☐ Very Strong
	☐ Strong	☐ Moderate	☐ Insufficient
• Originality and innovation • Significance and expected contributions to NSE research; potential for policy- and/or technology-related impact • Clarity and scope of objectives • Clarity and appropriateness of methodology • Feasibility • Extent to which the scope of the proposal addresses all relevant issues • Appropriateness of, and justification for, the budget • Demonstration that the Discovery Grant proposal is distinct conceptually from research supported (or submitted for support) through CIHR and/or SSHRC • Clear explanation why Discovery Grant funding is essential to carry out the research proposed in the DG application (for applicants who hold or have applied for a CIHR Foundation Grant)	Rationale for rating:		
Contributions to the training of highly qualified personnel	☐ Exceptional	☐ Outstanding	☐ Very Strong
	☐ Strong	☐ Moderate	☐ Insufficient

• Past contributions to the training of HQP
  • Training environment
  • HQP awards and research contributions
  • Outcomes and skills gained by HQP
• Training plan
  • Training philosophy
  • HQP research training plan
	Rationale for rating:		

Other comments (e.g., duration should be less than norm, special circumstances, quality of samples of contributions provided, Environmental impact, ethical concerns. Your Program Officer should be notified accordingly):

Comments from external referees (please also highlight any comments that would be deemed inappropriate for the members to have considered in their discussions):

Message to the applicant:

Discovery Accelerator Supplement (DAS)

- Regular DAS: Yes____ No_____
- DAS in Targeted Areas : Yes____ No_____

Rationale for DAS Recommendation:

This form is provided by NSERC as an aid to members for reviewing applications. The form contains personal information, and like all other review material, should be stored in a secure manner to prevent unauthorized access (please refer to Section 5 of the Peer Review Manual and to the text of your Confidentiality and Non-disclosure Declaration for more details on the Privacy Act.)

The rating sheet focuses on the evaluation criteria and integrates, where appropriate, external reviewer comments and any other relevant information, e.g., delays in research. Using the rating sheet will help to ensure that you take all selection criteria into account when formulating your recommendation (see Section 6 of the Peer Review Manual for details). Note that NSERC does not collect these forms, and they should be destroyed in a secure manner after the competition. (2010 version)

Source: NSERC Orientation Session

Discovery Grants Evaluation Criteria

Merit assessment uses six-point scale to evaluate:

- Excellence of Researcher
- Merit of Proposal
- Training of Highly Qualified Personnel (HQP)

+Cost of research (High, Normal, Low where applicable)

Equally weighted

DISCOVERY GRANTS MERIT INDICATORS

The Merit Indicators should be used in conjunction with the Peer Review Manual, which outlines how reviewers arrive at a rating.

		EXCEPTIONAL	OUTSTANDING	VERY STRONG	STRONG	MODERATE	INSUFFICIENT
Excellence of the Researcher		Acknowledged as a **leader** in terms of research excellence, accomplishments, and service.	Research excellence, accomplishments, and service are **far superior** to others.	Research excellence, accomplishments, and service are **superior** to others.	Research excellence, accomplishments, and service are **significant**.	Research excellence, accomplishments, and service are **reasonable**.	Research excellence, accomplishments, and service are **below an acceptable level**.
		Contributions presented in the application are of the **highest level of quality**.	Contributions presented in the application are of **high quality**.	Contributions presented in the application are **above average in quality**.	Contributions presented in the application are of **good** quality.	Contributions presented in the application are of **reasonable** quality.	Contributions presented in the application are **limited** in quality.
		Impact and importance of the work is **clearly evident** and **groundbreaking**.	Impact and importance of the work is **clearly evident** and **influential**.	Impact and importance of the work is **clearly evident**.	Impact and importance of the work is **evident**.	Impact and importance of the work is **somewhat evident**.	Impact and importance of the work is **not clearly evident**.
Merit of the Proposal		Proposed research program is clearly presented, is **extremely original** and **innovative** and is **likely to have impact** by **leading to groundbreaking advances** in the area and/or **leading to a technology or policy** that addresses socio-economic or environmental needs.	Proposed research program is clearly presented, is **highly original** and **innovative** and is **likely to have impact** by **contributing to groundbreaking advances** in the area, and/or **leading to a technology or policy** that addresses socio-economic or environmental needs.	Proposed research program is clearly presented, is **original** and **innovative** and **is likely to have impact** by **leading to advancements** and/or addressing socio-economic or environmental needs.	Proposed research program is clearly presented, is **original** and **innovative** and is **likely to have impact** and/or address socio-economic or environmental needs.	Proposed research program is clearly presented, has **original** and **innovative aspects** and **may have impact** and/or address socio-economic or environmental needs.	Proposed research program, as presented **lacks clarity**, and/or is of **limited originality** and **innovation**.
		Long-term vision and **short-term objectives** are **clearly defined**.	**Long-term goals** are **clearly defined** and **short-term objectives** are **well planned**.	**Long-term goals** are **defined** and **short-term objectives** are **planned**.	**Long-term goals** and **short-term objectives** are **clearly described**.	**Long-term** and **short-term objectives** are **described**.	**Objectives** are **not clearly described** and/or likely not attainable.
		The methodology is **clearly defined** and **appropriate**.	The methodology is **clearly described** and **appropriate**.		The methodology is **described** and **appropriate**.	The methodology is **partially described** and/or **appropriate**.	The methodology is **not clearly described** and/or **appropriate**.
		The application **clearly demonstrates** how the research activities to be supported are distinct from those funded (or applied for) by other sources.					The application **does not clearly demonstrate** how the research activities to be supported are distinct from those funded (or applied for) by other sources or does not clearly demonstrate a program of research in the NSE.
Training of Highly Qualified Personnel	Past Training of HQP	Past training is at **the highest level** in terms of the research training environment provided and HQP contributions to research.	Past training is **far superior** to other applicants in terms of research training environment provided and HQP contributions to research.	Past training is **superior** to other applicants in terms of the research training environment provided and HQP contributions to research.	Past training compares **favourably** with other applicants in terms of the research training environment provided and HQP contributions to research.	Past training is **modest** relative to other applicants in terms of the research training environment provided and HQP contributions to research.	Past training is **below an acceptable level** in terms of the research training environment provided and HQP contributions to research.
		Most HQP move on to **highly impactful** positions that require skills gained through the training received.	**Most** HQP move on to **impactful** positions that require skills gained through the training received.	HQP **generally** move on to **impactful** positions that require skills gained through the training received.	HQP **generally** move on to positions that require skills gained through the training received.	**Some** HQP move on to positions that require skills gained through the training received.	HQP **rarely** move on to positions that require skills gained through the training received.
	Training Philosophy & Research Training Plan	Training philosophy and research training plans are **of the highest quality**: **highly appropriate, clearly defined** and expected to produce **top quality** results in terms of the overall approach and specific projects for HQP.	Training philosophy and research training plans are **far superior**: **highly appropriate, clearly defined** and expected to produce **high quality** results in terms of the overall approach and specific projects for HQP.	Training philosophy and research training plans are **superior**: **highly appropriate**, **clearly defined** and expected to produce **quality** results in terms of the overall approach and specific projects for HQP.	Training philosophy and research training plans are **appropriate** and **clearly defined** in terms of the overall approach and specific projects for HQP.	Training philosophy and research training plans are **partially appropriate** and **partially defined** in terms of the overall approach and specific projects for HQP.	Training philosophy and research training plans are **not appropriate** and **not clearly defined** in terms of the overall approach and specific projects for HQP.
		Challenges related to equity, diversity and inclusion specific to the institution **and** field of research are **clearly described**.		Challenges related to equity, diversity and inclusion specific to the institution **and** field of research are **described**.	Challenges related to equity, diversity and inclusion specific to the institution **and/or** field of research are **described**.	Challenges related to equity, diversity and inclusion specific to the institution **and/or** field of research are **partially described**.	Challenges related to equity, diversity and inclusion specific to the institution **and/or** field of research are **inaccurate** or **not described**.
		Specific actions to support the recruitment of a diverse group of HQP **and** an inclusive research training environment are **clearly defined**.		Specific actions to support the recruitment of a diverse group of HQP **and** an inclusive research training environment are **defined**.	Specific actions to support the recruitment of a diverse group of HQP **and/or** an inclusive research training environment are **defined**.	Specific actions to support the recruitment of a diverse group of HQP **and/or** an inclusive research training environment are **partially defined**.	Specific actions to support the recruitment of a diverse group of HQP **and/or** an inclusive research training environment are **not appropriate** or **not defined**.

Source: NSERC Discovery ROADS Info Session

Excellence of Researcher

- Knowledge, expertise and experience
- Importance of contributions to research
    - Focus on NSE impact
- The entire community is used as a reference to help interpret the qualifiers in the grid
- Focus on past six years (anything outside of this is not considered)
- Only material in the application can be discussed at competition
- Reviewers to advise not to use links to internet sites

Criterion	Application Grant Proposal	CCV Researcher Profile
Excellence of the Researcher (EoR)	**Sections** - Most Significant Contributions - Additional Information on Contributions (choices of venues, order of authors) - Samples of Research Contributions (max of 4)	**Sections** - Contributions (publications, books, patents, etc.) - Recognitions (honours, prizes and awards) - Administrative Activities (editorial, collaborations, event organization, tech. transfer) - Membership (service on committees)

Source: NSERC Orientation Session

Merit of the Proposal

- Originality and innovation
- Significance and expected contributions to NSE
- Clarity and scope of objectives
  - Must **describe a program** of research, **NOT A PROJECT,** that will advance knowledge in the NSE
- Clarity and appropriateness of methodology
- Feasibility of program
- Appropriateness of budget
  - Relationship to other sources of funds clearly explained

Criterion	Application Grant Proposal	CCV Researcher Profile
Merit of the Proposal (MoP)	**Sections** - Proposed Expenditures - Relationship to Other Research Support - Proposal - List of References - Budget Justification **Standalone attachment (when applicable)** - Other Support Sources (mainly for CIHR & SSHRC grants)	**Section** - Research Funding History (to assess possible conceptual or budgetary overlap)

Source: NSERC Orientation Session

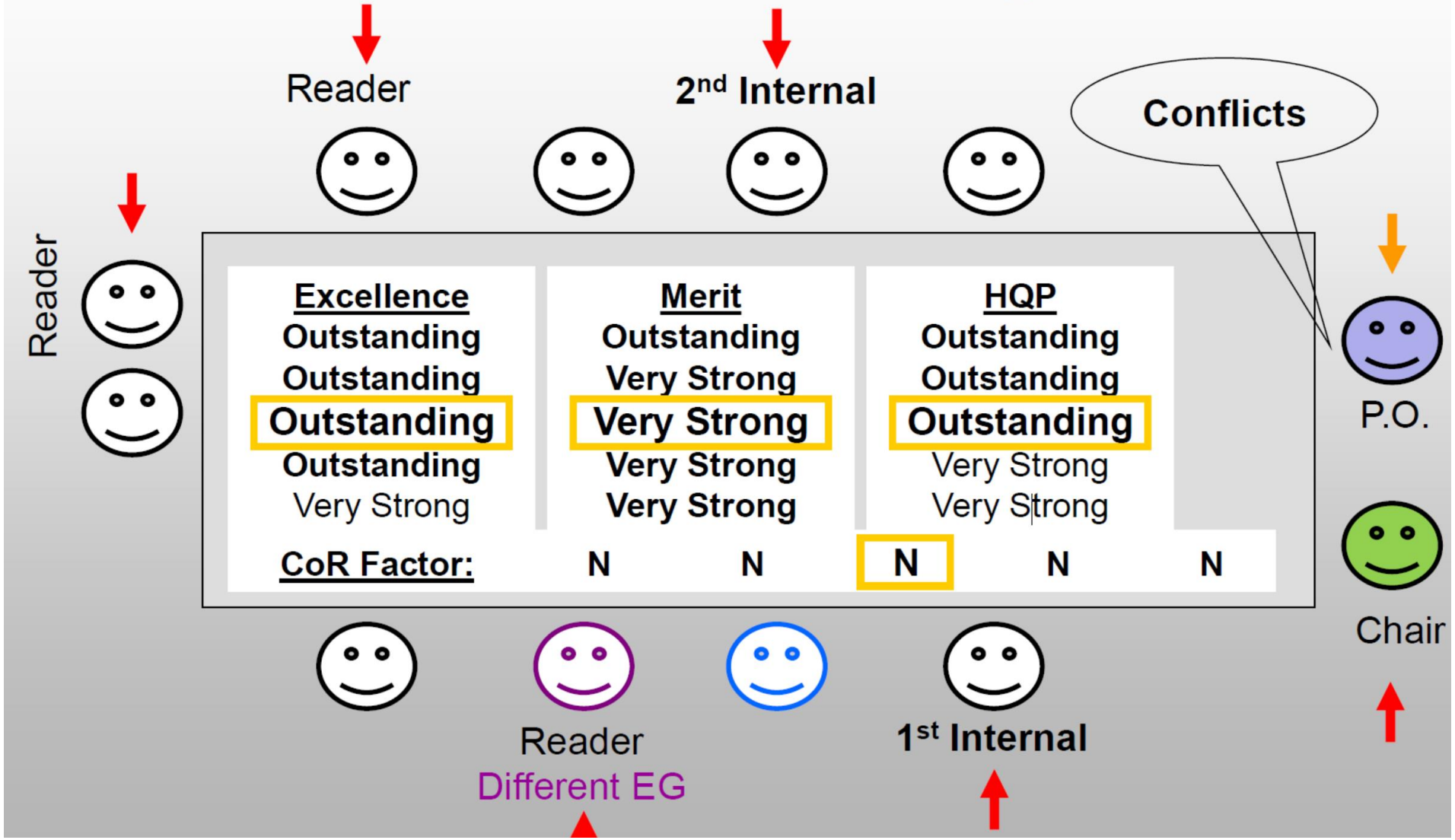
Contributions to the Training of HQP

- The assessment of contributions to training of HQP is based on both the record of training (in the past) and the plans for training (in the future)
- Quality, extent and impact of contributions during the last six years
- Appropriateness and quality of training plan in the Natural Sciences and Engineering
- Enhancement of training arising from a collaborative or an interdisciplinary environment, where applicable
- NSERC values all levels of HQP (undergraduates conducting research to PhD and postdoctoral) although the committee focus on thesis is based on MASc and PhD
- Remember to include “Consideration of equity, diversity and inclusion in past and planned training of HQP."

Criterion	Application Grant Proposal	CCV Researcher Profile
Contributions to the Training of Highly Qualified Personnel (HQP)	**Sections** - HQP Training Plan (students' role, knowledge and skills acquired) - Past Contributions to HQP Training	**Sections** - Supervisory Activities - Contributions (co-authors who are trained HQP are to be identified by an asterisk *)

Source: NSERC Orientation Session

Implementation of the Conference Model and Use of the Rating Indicators



Source: NSERC Orientation Session

Step 1 - Merit assessment

	Exceptional	Outstanding	Very Strong	Strong	Moderate	Insufficient
Excellence of the researcher	X X	X X	X			
Merit of the proposal		X X	X X X			
Contribution to the training of HQP		X X	X X		X	

Outstanding – Very Strong – Very Strong

Step 2 – Funding Recommendation

Funding Bin	A	B	C	D	E	F	G	H	I	J	K	...	P
Value	...$	...$	...$	...$	...$	...$	...$	...$	...$	...$	...$	...$	...$

Source: NSERC Orientation Session

Application Purpose

Make the reviewers (possibly 10) believe:

- this research is novel and important
- there is benefit to Canada
- you are qualified to carry it out

These reviewers may be:

- experts in your area
- a researcher in a similar department/stream you are in but not an expert in your area
- someone from industry in your field
- or someone you would not expect or believe has the qualifications to review your proposal

Proposed Research

- You are presenting a PROGRAM (not a project) so provide 2-3 aspects of research, paths you will explore
- Indicate alternate paths if research involves risk and explain what happens if there are issues or the results negative: what are your fall-back positions, your Plan B
- Link together through common theme
- Indicate who will participate in what piece of research (PhD, MASc) making sure the level is appropriate for task
- Name graduate students that you know will work on proposed research or provide numbered labels for future students (PhD2)

Objectives

- State explicitly your short-term (1 to 4) and long-term objectives
- Long-term objectives should be far-reaching research
- Discovery Grants support fundamental research

Objectives – Short Term

“The short-term objectives of the proposed research will expand upon fundamental experimental studies spearheaded by my research team towards the development of novel EHD enhanced thermal management solutions. In the next 5-years, we will:

1) Investigate the discovery by my **former HQP** that applied high voltages can be used to yield unique two-phase (liquid-vapor) flow patterns and can remove liquid films to augment and tune the rate of heat transfer dynamically. The use of integrated electrodes into a heat transfer surface will be studied under variable voltage levels and frequencies to develop control strategies for an electrohydrodynamic (EHD) heat exchanger.

2) Study the effect of direct and alternating current waveforms on the heat transfer process during melting of different phase change materials and encapsulation-electrode arrangements to understand the effect of electric field distribution on EHD solid extraction and secondary liquid motions for both conduction and convection dominated melting.

3) Explore the hypothesis that doping a dielectric medium with micro-particles of a different dielectric constant can induce a stirring effect in the liquid and potentially enhance solid extraction at the solid-liquid interface.”

4)….

HQP 2 Parts

Past contributions to the training of HQP

1.Training environment

2.HQP awards and research contributions

3.Outcomes and skills gained by HQP

Focus on **quality and **impact** of training**

Future plans for training

1. Training Philosophy

2. Research Training Plan

Focus on **quality, **suitability** and **clarity** of plan**

HQP

- Explicitly state the number of HQP you will train over the course of 5 years—even if you have mentioned them already in budget justification or throughout description of proposed research
- “Through my proposed research I will train five Ph.D. students, three M.Sc. students and a postdoctoral fellow. HQP trained by me will …”
- State what skills the HQP you train will acquire
- State exactly what each HQP will do
- Make sure you tell the reviewers about the success of your past students…Best Paper Awards, Great jobs, Start up companies, Scholarships, Academics

HQP - Consider equity, diversity and inclusion (EDI) in your application.

- “Applicants are encouraged to **promote approaches that increase the inclusion and advancement of women and other under-represented groups** in NSE.
- Applicants should describe their planned approach to promoting participation from a diverse group of HQP, taking into account equity in recruitment practices, mentorship and initiatives aimed at ensuring an inclusive research and work environment.”

References

- Make sure references are not just your past papers
- Make sure your references are not just ones that use the specific approach you plan to use
- Provide references from a broader area to compare against

Cost of Research

- Relative cost of research of the proposed research program as compared to the norms for a given discipline / field of research
  - –High, Normal, Low
  - –The majority of applications are deemed to have normal costs of research relative to the EG
  - –Availability of other sources of funding does not affect the assessment of the relative cost of research

Budget Justification

- Justify your numbers and do your homework
- Budget should be realistic - Numbers that are too high look dishonest or suggest you are clueless or unprepared
- NSERC Discovery is “grant in aid” - but is not meant to support the full costs of a research program
- If others in your department are applying be consistent, if possible, in HQP salaries. Discuss with your colleagues.
- Don’t expect NSERC committee to read in detail “unless not normal”. If you didn’t have room in your proposal or HQP Sections to give the required amount of detail **do not use this space to add new important stuff here**! However you can emphasize content from your other sections.

Early Career Researcher

- Early Career Researchers (ECR) are applicants who have held an independent academic position for 5 years or less. For example, to be classified as an ECR, a researcher submitting an NOI in August 2021 would have been hired on or after July 1, 2016.

An independent academic position is a position that:

- is a university faculty appointment (tenured or non-tenured);
- requires that the researcher engages in research that is not under the direction of another individual;
- authorizes the researcher to supervise or co-supervise the research of students registered in an undergraduate or graduate degree program, or postdoctoral fellows.

Advice

Proposal should stand on its own

-Emphasize originality & innovative aspects of your work and potential impact – incremental work is not viewed highly by EG

–Reader should not have to read your papers to understand proposal

–Reader will not use internet to understand proposal or find acronyms - it is prohibited by EG members

Have your draft read by others

–By experts in your research area – your students/pdfs

–By people in your department who know very little about your area

–By non-NSE people who are good writers or editors

Advice

- Avoid acronyms
- Checked for spelling, grammar
- Leave spaces between sections
- Make sure your program does not sound like a series of projects
- Bold names of HQP that you have supervised or will supervise anytime you mention them
- Indicate HQP in Journal papers and when they present at conferences
- Be very clear about methodology – be specific
- Do not pad your CCV – do not include your H-factor or citations

Advice

- Your 4 Journal papers submitted are extremely important. Primary method to assess quality. Make sure they are within the past 6 years.
- Your training philosophy and plan and past training outcomes are as important as the Proposal – spend as much time on it!
- Use all of the space provided
- Do not use Administrative Appointments as a reason for delays in your research – it is considered a career choice
- Do not list Capstone Undergrads as HQP – USRAs are good
- Masters (non-thesis is generally not considered research)
- Include EDI - Considering equity, diversity and inclusion throughout your application.

Advice

Follow *all* instructions given by NSERC

- Ordering, bolding, margins, page limits, years of contribution (6)
- Review NSERC Discovery FAQ http://www.nserc-crsng.gc.ca/Professors-professeurs/FAQ-FAQ_eng.asp

Do not include the role of Academic Advisor in your NSERC CCV. Typically Academic Advisor is not considered an official supervisor role in the evaluation of the contributions to HQP.

Good Luck!