

February 18, 2011

Mr. Iain Stewart
Secretary to the Expert Panel
1200 – 270 Albert Street
Ottawa, ON
K1A 5G8

Dear Mr. Stewart,

Please find enclosed NOVA Chemical's submission in response to the consultation paper issued by the Expert Panel on December 22nd, 2010.

NOVA Chemical's principal business is the production and marketing of plastics and chemicals. We operate an Olefins/Polyolefins business unit that produces and markets ethylene, polyethylene, higher-value polyethylene manufactured using our Advanced SCLAIRTECH™ technology, and a variety of chemical and energy products (commonly known as co-products). We also operate a Performance Styrenics business that produces and markets higher value styrenic polymers (such as Expandable Polystyrene). NOVA's Technology function operates two world class facilities – the NOVA Research & Technology Corp. and the NOVA Chemicals Technology Center – both located in Calgary, Alberta.

In our submission, NOVA addresses the SR&ED tax credit program: direct vs. indirect funding; reducing the administrative burden on businesses and how businesses work with post-secondary institutions. Specifically, NOVA recommends that the federal government make five specific changes to the SR&ED tax credit program, including modifying the claim process and extending the Accelerated Capital Cost Allowance program. NOVA also recommends the federal government engage Canadian businesses in discussions around how to fund the private sector in innovation activities and promote effective working relationships between businesses and academic institutions who are engaged in applied research.

Thank you for the opportunity to make this submission. We would be pleased to discuss the recommendations further with you.

Sincerely,

Daryll Harrison
VP Technology, NOVA Chemicals



Submission to Federal R&D Review Panel

NOVA Chemicals

Business Overview

Our principal business is the production and marketing of plastics and chemicals. We operate an Olefins/Polyolefins business unit that produces and markets ethylene, polyethylene, higher-value polyethylene manufactured using our Advanced SCLAIRTECH™ technology, and a variety of chemical and energy products (commonly known as co-products). We also operate a Performance Styrenics business that produces and markets higher value styrenic polymers (such as Expandable Polystyrene).

Our polyethylene and styrenic polymer resins are used in a wide range of applications including rigid and flexible packaging, containers, plastic bags, plastic pipe, consumer electronics, building and construction materials, housewares and other industrial and consumer goods.

In addition to our principal business of producing and marketing plastics and chemicals, we have a licensing business. For example, we offer for license our proprietary polyethylene SCLAIRTECH™ process technology and our proprietary catalyst technology for polyethylene production.

Production Facilities and Operating Sites

Our products are manufactured at seven sites in North America. All production facilities are owned by NOVA, with the exception of LyondellBasell's PO/SM facility in Channelview, Texas, in which we have a minority interest and the E3 manufacturing plant at Joffre, Alberta, in respect of which we and Dow each own 50%. Our head office is located in Calgary, Alberta. Our United States commercial center is located in Moon Township, Pennsylvania. For a summary of NOVA's manufacturing facilities, please refer to Table 1 in the Appendix.

Research and Development

NOVA's Olefins and Polyolefins business units conduct research at the NOVA Chemicals Research & Technology Center and the NOVA Chemicals Technical Center, both located in Calgary, Alberta. Both centers are equipped with state of the art facilities for the development of new catalysts and olefin/polyolefin processes as well as full scale testing of new products. Catalysts are an essential component of plastics and petrochemical manufacturing, and chemical processes a requirement for safe, efficient transformation of raw materials (typically referred to as "feedstocks") into finished products. The demonstration plant for Advanced SCLAIRTECH technology is located at the St. Clair River site in Corunna, Ontario, and is capable of testing new catalysts, new polyethylene products and reactor processes.

The following table summarizes, for the years ended December 31, 2010, 2009 and 2008, the amount we spent on research and development activities and technical support from continuing operations, including activities to improve our existing products:

	Year Ended December 31,		
	2010	2009	2008
Research and Development.....	\$30 million	\$30 million	\$39 million
Technical Support	\$5 million	\$4 million	\$5 million

In 2009 and 2010, the amount that NOVA spent on research and development and technical support was lower due to reductions that were primarily in NOVA’s Styrenics business unit in the United States, a direct consequence of market and economic factors.

Polyethylene Process Technologies

NOVA has acquired a variety of business units with associated technology assets in areas including process and catalyst technology, as well as polymer technologies. In addition, since 1994 we have expanded our research and development activities. The result is a technology portfolio with approximately 600 patents, margin-enhancing polyethylene process technologies such as Advanced SCLAIRTECH technology and proprietary single-site catalyst positions.

NOVA owns two key technologies for the production of polyethylene-SCLAIRTECH technology and Advanced SCLAIRTECH technology. In addition to these technologies, we conduct research and development on other polyethylene technologies including gas-phase and high-pressure technology.

NOVA acquired our proprietary SCLAIRTECH technology and a global SCLAIRTECH technology licensing business from DuPont Canada Inc. in 1994. Our St. Clair River site utilizes SCLAIRTECH technology to produce SCLAIR® HDPE resins. In addition, our SCLAIRTECH technology is currently licensed for use at 12 plants worldwide. In 2001, we began commercial operation of our new, proprietary Advanced SCLAIRTECH technology for the production of polyethylene and in 2002, a line of new, Z-N catalyzed, octene-based SCLAIR® resins was launched intended for higher-value polyethylene film applications (see Figure 1, Appendix). In April 2003, we announced the commercial introduction of our first polyethylene resins produced with Advanced SCLAIRTECH technology and utilizing our new proprietary single-site catalyst. We manufacture and sell these polyethylene resins under the trademark SURPASS®. SURPASS resins have been commercialized for film, rotational molding and thin wall injection molding applications.

We continue to focus on developing and commercializing higher value polyethylene manufactured using Advanced SCLAIRTECH technology, including those used in film, injection molding and rotational molding.

Catalyst Technology

We have developed three key proprietary families of catalyst technologies for polyethylene production. The first is a family of proprietary single-site catalysts for Advanced SCLAIRTECH technology and other polymer technologies including gas-phase polyethylene. These single-site catalysts impart unique properties and create products that compete with many metallocene-based polyethylene products. The second family of catalysts includes proprietary Z-N catalysts used for SCLAIRTECH technology and Advanced SCLAIRTECH technology. Finally, the NOVACAT® family of catalysts was developed by us and our catalyst development partner, INEOS, for use in gas-phase polyethylene. The NOVACAT family of catalysts is currently being run on several different gas-phase technologies by us and licensees.

Olefins and Pipelines Technology

NOVA operates a number of experimental units for the study of new materials and design components used in our world scale olefins production units in Joffre, AB, and Sarnia, ON. Beyond the immediate benefits to plant reliability and operating efficiency, the results of R&D work have provided breakthrough technologies such as “ANK 400” (see below), for use by NOVA and its’ licensees.

Review of Current Federal R&D Initiatives

The current federal SR&ED program has provided great benefit to NOVA Chemicalsby:

- (a) Enhancing our ability to develop and maintain world class R&D resources in our Calgary, AB Technology locations, and
- (b) Attracting highly qualified scientists, engineers and technologists, who have been critical to the developments previously reported in this submission, and
- (c) Assisting the translation of scientific discovery to commercial industrial practice by funding, in part, the critical steps of technology scale up and demonstration. These steps are typically the most costly of any new technology development process within the petrochemical industry, and success at this stage is a primary determinant of capital allocation to existing or new manufacturing facilities.
- (d) Encouraging investment on basic research in the fields of olefin and polyolefin catalyst science, computational fluid dynamics, molecular modeling, polymer and metals material science, and environmental science.

The most evident example of the benefit of the SR&ED program within NOVA relates to the development and commercialization of Advanced SCLAIRTECH technology, a globally competitive platform for the production of polyethylene polymers. NOVA effectively competes, primarily in North America, with both the Dow Chemical Company and Exxon Mobile Chemical in the sales of performance polyethylene polymers, on the basis of the outstanding products made in Joffre, Alberta. NOVA’s operating cost investment in developing the process and catalyst technology for Advanced SCLAIRTECH is conservatively estimated at \$100M CDN, during the period 1994-2001, and additionally \$55M CDN during the period 2002-2010 for process optimization and product development. R&D related capital

spending for this project during this same period included \$10M CDN for a mini-pilot plant in Calgary, AB, and \$26M for a demonstration plant in Sarnia, ON. That NOVA has established itself as a successful competitor with companies such as Dow and Exxon Mobile, both having highly capable and heavily funded R&D functions, reflects very positively on the benefits of the SR&ED program as a catalyst for Canadian innovation.

NOVA conducts R&D activities in support of its' Olefins Business Unit, with projects specifically focused on operating efficiency improvement, energy reduction (including GHG emissions reduction) and plant reliability. NOVA's enhanced ability to undertake applied research in these areas, attributed in part to the benefits of the SR&ED program, have resulted in breakthrough technologies such as "ANK 400", a proprietary metallurgical treatment of tubes used in steam cracking furnaces. This technology has provided NOVA with energy and operating cost savings of greater than \$80M CDN since implementation in the mid-1990's. In addition to NOVA's internal use, this technology has been made available on a global basis, as part of a joint licensing effort with Kubota Ind. of Japan.

Based on a targeted business need, and greatly facilitated by the SR&ED program, NOVA has conducted basic research in understanding the mechanisms and mitigation of corrosion processes in pipelines used for hydrocarbon transportation. This work, conducted with the financial support of TransCanada Pipeline Inc., involves lengthy and costly experimental work yielding results highly useful to an understanding of pipeline integrity, and ultimately useful for industry in mitigating the negative consequences of pipeline rupture.

NOVA Chemicals' participation in programs that provide direct support of innovative business R&D (for example, the Industrial Research Assistance Program) has been limited, to date, as these programs have generally been targeted towards industrial sectors other than the core businesses of NOVA, or alternatively, NOVA does not meet the qualification guidelines.

Since the inception of NOVA's business-centered R&D activities in 1983, NOVA has provided direct funding to Canadian universities, colleges and technical schools to supplement the scientific advances made through the internal funding of basic research activities. The NOVA-sponsored programs have served to (a) provide advancement of scientific knowledge complimentary to that generated via internal funding, and (b) promote interest for and education in the chemical science and engineering fields with students, and (c) on rare occasions, generate breakthrough inventions of significant benefit to NOVA. For a variety of reasons, NOVA's access to skilled graduate and post-graduate researchers is now reduced compared to the period of 1990 through 2005, particularly in the areas of material science and engineering. Programs such as the Industrial Post-Doctoral Scholarships Program have not, in NOVA's experience, provided sufficient incentive to grow the pool of talent serving the R&D function of the petrochemical sector in Canada.

Recommendations to the Panel

SR&ED Program

Concerning the existing design and practice of the SR&ED program, NOVA recommends retention of the current SR&ED program with consideration given to the following structural improvements:

- (a) Consider modifying SR&ED claims to allow for their refund ability for all claimants, thereby promoting steady business R&D expenditures throughout the economic cycle.
- (b) Extend the Accelerated Capital Cost Allowance from two years to a minimum of five years to promote new capital investment in facilities to demonstrate new technologies and in facilities implementing those technologies in Canadian manufacturing locations.
- (c) Establish a grandfathering provision for shared use equipment claims to prevent the recapture of tax credit claims made prior to 2008.
- (d) Expand the SR&ED program to include a broader range of expenditures, including the capital and operating costs associated with experimental work performed in commercial scale facilities, particularly where those facilities include “new to world” innovation.
- (e) Review and recommend changes for the purpose of administrative simplification of SR&ED submissions, via aggregation of project documentation into program documentation, where programs are defined as distinct commercial business objectives.

Direct Support for Business R&D

Concerning the existing programs that provide direct support for business R&D and innovation within Canada, NOVA recommends:

- (a) Further study, via a government/industry forum, on the comparative effectiveness of direct vs. indirect funding, to analyze strengths and weaknesses of both approaches from a Canadian perspective.
- (b) It is further recommended the study focus on the crucial “reduction to practice step” which is the near exclusive domain of business R&D institutions (and not, for example, the generally accepted function or practice of Canadian academic institutions), and one where the Canadian manufacturing sector may be inherently disadvantaged on a global basis due to disparities in access to pools of working capital.

Universities, Colleges and Networks

Finally concerning the nature of working interface between Canadian academia and the business R&D sector, improvements in innovation could be achieved via the following recommendations:

- (a) Promoting more effective working relationships within academic institutions between those researchers undertaking basic research and those undertaking applied research.
- (b) Revising the structural framework of ownership and intellectual property rights between universities and business R&D to more reasonably reflect the contributions of each.
- (c) Encourage, through sponsored networks, a greater understanding of future requirements for skilled R&D workers, and promote simple, effective programs for access to such resources.

Appendix

The following table shows our plastics and chemical production facilities:

Table 1: Facility Profile (Olefins/Polyolefins)

Site	Feedstock's	Main Products	Rated Capacity	
			(mmlbs/year)	(kilotonnes/year)
1. Joffre, Alberta.....	Ethane/Propane	Ethylene (E1)	1,600	730
	Ethane/Propane	Ethylene (E2)	1,800	820
	Ethane	Ethylene (E3)	1,400	640
		Co-products	830	380
	Ethylene	LLDPE (PE1)	1,480	670
2. Corunna, Ontario.....	Crude Oil, Condensates, Ethane, Butane, Propane, Naphtha, Gas Oils	LLDPE & HDPE (PE2)	950	430
		Ethylene	1,800	820
		Co-products	4,700 ¹	2,130
3. St. Clair River, Corunna, Ontario.....	Ethylene	HDPE	450	205
4. Mooretown, Ontario	Ethylene	HDPE	465	210
		LDPE	375	170
TOTAL ETHYLENE PRODUCTION CAPACITY (Design Production)			6,600	2,990
TOTAL POLYETHYLENE PRODUCTION CAPACITY			3,720	1,685

Figure 1: An Overhead View of NOVA's Advanced SCLAIRTECH polyethylene plant (PE2). Joffre, Alberta

