



Canadian Hydrogen
and Fuel Cell Association

2011 Budget Submission
to the
Government of Canada

by the
Canadian Hydrogen and Fuel Cell Association
July 2010

Contact:

John Tak, President and CEO
Direct Line: 604-822-9849
jtak@chfca.ca

www.chfca.ca

Canadian Hydrogen and Fuel Cell Association 2011 Budget Submission Introduction

The successful deployment of clean energy technologies requires the right combination of private sector-led investment and government policy. Canadian companies are leaders in the development of hydrogen and fuel cell technology as a result of their partnership with the Government of Canada. The return on government investment is 2,000 jobs, a solid base of tax revenues, a more diversified economy and technology companies that contribute to a cleaner and healthier environment. Canadian hydrogen and fuel cell companies are clean energy R&D leaders with approximately \$200 million invested per year from 2003 to 2008. With some Canadian success in early commercial sales, now is the time to ensure that industry and government work together to secure Canada's share of the global market for hydrogen and fuel cell products.

A recent Canadian economic impact study completed in March 2010 conservatively estimates that by 2020, the hydrogen and fuel cell sector will create 14,500 jobs and achieve revenues of \$1.2 billion.

The Canadian Hydrogen and Fuel Cell Association (CHFCA) recommends that the Government of Canada deepen its partnership with our sector to accelerate the commercialization of hydrogen and fuel cell products and ensure that benefits of industrial growth continue to accrue in Canada. Sales of hydrogen and fuel cell products are growing in countries where government policies stimulate commercialization. The CHFCA requests that the Government of Canada implement similar policies to ensure that our companies have the opportunity to sell their product domestically and compete on a level-playing field:

We respectfully submit our 2011 budget policy request:

2011 Budget Submission Policy Request Summary:

1. Fuel Cell Purchase Incentive

- Tax credit of 30% of the cost of the fuel cell product to a maximum of \$3,000 per kW (convertible to a 30% capital grant at the discretion of the Business Property Owner).

2. Hydrogen Infrastructure Investment Incentive

- A grant of 50% of the cost of a Hydrogen Refueling Station up to a maximum government contribution of \$375,000 per station.

3. Utility-scale Hydrogen & Fuel Cell Project Funding

- Provide up to 33% of the construction cost of a hydrogen and fuel cell system for applications at the utility-scale of >100 kW.

4. Hydrogen and Fuel Cell Commercialization Road Map

- Update Canada's *Hydrogen and Fuel Cell Commercialization Road Map* with a focus on the role of fuel cell electric vehicles and the necessary strategies to deploy them in Canada.

Policy Request 1: Fuel Cell Purchase Incentive

Objective:

Stimulate sales of fuel cell products in Canada by harmonizing Canadian policy with current U.S. policy that offers a purchase incentive by means of a tax credit. This will support the development of our Canadian hydrogen and fuel cell companies and anchor them in Canada leading to targeted job growth in a sunrise sector. The purchase incentive will also create a competitive climate in Canada for capital investment in low-carbon fuel cell technology.

Canadian hydrogen and fuel cell products are selling today in the U.S. More than 70% of the fuel cells used in materials handling applications (fork lift trucks) in the U.S. are made in Canada. Canada also supplies product into the U.S. back-up power systems market. Utility-scale fuel cell plants providing low-carbon, near-zero emission electricity to urban power grids are selling where appropriate incentives are in place.

On October 3rd, 2008, the U.S. Congress passed into law an Investment Tax Credit (ITC) for fuel cell technology. We recommend that Canada match this purchase incentive as follows:

- Provide a Business Owner who purchases a fuel cell product with tax credit of 30% of the cost of the fuel cell product to a maximum of \$3,000 per kW. The tax credit should be convertible into a 30% capital grant at the discretion of the Business Owner.

Key points of the tax credit are:

- Commencing in fiscal 2011 and valid until March 31, 2016;
- For product lease, the fuel cell investment tax credit may be claimed by the lessor if depreciation (or amortization in lieu of depreciation) is allowable;
- The initial two year cost to government of this incentive is expected to be \$8 million (with a larger cost delayed to later years as purchases accelerate);
- Generating close to \$200 million of investment in capital equipment, the total cost to government of this procurement incentive is \$60 million over five years.

Note: See Appendix 1 for estimated sales and the cost of the incentive.

Policy Request 2: Hydrogen Infrastructure Investment Incentive

Objective:

Stimulate early market adoption of products requiring hydrogen as a fuel. Near-term markets include materials handling operations and public transit.

We project a ramping up of the requirement for hydrogen refueling for industrial markets through the fiscal years 2011 to 2016. Up to 17 refueling stations could be built at a maximum public investment of less than \$7 million over five years. Industrial hydrogen fueling stations are different than automotive retail fueling stations. However, an early start to industrial hydrogen fueling infrastructure should help Canada with the next steps required for the hydrogen fueling infrastructure for fuel cell vehicles. Automakers anticipate commercial deployment of these vehicles in 2015 (see third paragraph on page six).

We recommend that Canada create a Hydrogen Infrastructure Investment Incentive as follows:

- A grant of 50% of the cost of a hydrogen refueling station up to a maximum government share of \$375,000 per station.

Key points of the investment incentive are:

- Commencing in fiscal 2011 and Valid until March 31, 2016;
- Generating close to \$13 million of investment in capital equipment, the government cost of this incentive is estimated to be less than \$7 million over five years;
- The initial two year cost of this incentive is expected to be \$2 million. Purchases would accelerate in the later years.

Note: See Appendix 1 for estimated sales and the cost of the incentive.

Policy Request 3: Utility-scale Hydrogen & Fuel Cell Project Funding

Objective:

Stimulate the adoption of hydrogen and fuel cell technology for the purposes of utility scale energy applications.

Utilities are seeking ways to improve energy efficiency through technologies that create a smarter grid and help manage the intermittent nature of renewable energy inputs on those grids. Hydrogen and fuel cell technology offers unique capabilities to assist in both of these areas.

Utilities will help us determine applications that provide them a benefit. For example:

- Improve Grid Reliability – Hydrogen products help regulate frequency and provide demand response and/or spinning reserve capability.
- Enable Renewable Energy – Wind and solar electricity is intermittent. When it's available but not needed, we can store this electricity in the form of hydrogen and return it to the grid when it is needed. This solution balances renewables in micro grids in remote and northern communities.
- Distributed Generation in Constrained Areas – Hydrogen systems are zero-emission, modular and low-noise allowing them to be used in congested areas where the power is needed the most.

Targeted applications under this proposed program are:

1. Remote Community Hydrogen Energy Storage – A hydrogen energy storage system can be coupled with a renewable energy source such as wind, solar or small hydro to replace diesel power generation.
2. Waste Hydrogen Stationary Fuel Cell – Many industrial processes produce hydrogen as an off-gas, typically referred to as 'waste hydrogen'. The development of utility-scale fuel cells of >1MW creates an opportunity to use these fuel sources for generating clean energy for our grids.
3. Demand Response or Ancillary Services using Hydrogen – Large-scale hydrogen electrolysis systems for industrial purposes provide a better way to control load on the grid. This service is being sought by grid operators, utilities, and power authorities across Canada.

We recommend that Canada provide utility scale hydrogen and fuel cell project funding as follows:

- Provide up to 33% of the construction costs of the hydrogen and fuel cell system for applications at the utility-scale of greater than 100 kW;
- Commencing in fiscal 2011 and Valid until March 31, 2016;
- The cost of the incentive is estimated to be less than \$20 million over 5 years. This is based on three projects per year with an average cost of \$4 million per project.

Policy Request 4: Hydrogen and Fuel Cell Commercialization Road Map

Objective:

Update Canada's *Hydrogen and Fuel Cell Commercialization Road Map* with a focus on the role of fuel cell electric vehicles, associated retail hydrogen fueling stations, and the necessary strategies to deploy them in Canada.

In the past five years, industry has invested approximately \$1 billion in the development of hydrogen and fuel cell technology and related components for electric vehicles. This investment was stimulated by a matching investment of \$170 million by the federal government. Canadian companies have pioneered key elements of the technology – from the fuel cell stack which is the heart of the fuel cell engine, to 700 bar fueling technology and hydrogen storage tanks. Major automotive companies Daimler and Ford Motor Company have invested in a joint venture company in Canada to develop their next-generation fuel cell stacks. This joint venture, Automotive Fuel Cell Cooperation Corp., is now the largest automaker R&D facility in Canada.

Fuel cell and hydrogen technology is being commercialized in Japan, Germany, Korea, and the USA, as these countries have major programs and commercialization roadmaps for this strategic technology with automotive being the centre. Supporting a Roadmap in Canada will have secondary benefits as significant synergy exists between automotive and non-automotive sectors. Automotive fuel cell technology transfers directly to buses, forklifts, and fueling infrastructure. For Canada to further realize the benefits of this technology, it is critical that we update our own roadmap with a solid plan that incorporates the input from all stakeholders: automakers, energy companies, industrial gas companies, and government. This plan would include vehicle deployment, retail hydrogen refuelling infrastructure, and the regulatory framework.

On September 9, 2009, leading vehicle manufacturers in fuel cell technology — Daimler AG, Ford Motor Company, General Motors Corporation/Opel, Honda Motor Co., Ltd., Hyundai Motor Company, Kia Motors Corporation, the alliance Renault SA and Nissan Motor Corporation and Toyota Motor Corporation — issued a joint a Letter of Understanding stating their intention to commercialize fuel cell vehicles from 2015.

An updated plan would be an important policy signal to welcome further foreign direct investment into Canada and help expand exports of fuel cell products – both automotive and non-automotive.

About the Canadian Hydrogen and Fuel Cell Sector

Why the Canadian Hydrogen and Fuel Cell Sector is Important

- We contribute 2,000 direct, high-paying, innovation-based jobs in a sunrise sector.
- We will employ 14,500 Canadians and achieve \$1.2 billion in revenues by 2020.
- We are one of Canada's top clean energy R&D investors - \$200 million per year. More than 80% of the R&D in the hydrogen and fuel cell sector is funded by the private sector.
- We have Canada's largest automaker R&D centre working on fuel cells. Daimler and Ford have a joint venture in Vancouver developing fuel cell vehicles. Called Automotive Fuel Cell Cooperation Corp., this JV employs 200 people.
- We are selling products today: fuel cell electric forklift trucks, back-up power systems for telecom towers, hydrogen-producing electrolyzers, stationary fuel cell power systems and fuel cell electric buses in the U.S., Japan, Germany, Korea and India.
- We are selling to major entities such as Walmart, AT&T, Coca-cola, Whole Foods and BC Transit.

Benefits of Hydrogen and Fuel Cell Technology

- Hydrogen and fuel cells help achieve carbon reduction goals with CO₂ reductions ranging from 40% or better using conventional fuel to nearly 100% using hydrogen derived from renewables such as wind, solar, and nuclear.
- Hydrogen and fuel cells produce benefits in many applications: power generation, industrial equipment, transportation, military power and consumer electronics.
- Provide secure and affordable stationary power systems in remote First Nations and Inuit communities with much less environmental impact than conventional diesel generators.
- Hydrogen and fuel cells can help provide stability and continuity to the electric grid since they can provide continuous "base load" power in parallel with or independent of the grid. In addition, they can support intermittent renewable energy. These attributes make them ideal resources for supporting critical loads for civilian and military.
- Produce clean electricity using direct oil and gas inputs such as natural gas or gasified coal.
- Hydrogen has an excellent safety record. Canada safely produces 3 million tonnes of hydrogen annually for a variety of industrial uses. The U.S. produces 9 million tonnes annually.

Economic Development Through Clean Energy Innovation

The successful deployment of all clean energy technologies is based on public-private partnerships (e.g. nuclear, wind, ethanol and solar power). Canada is a leader in the development of hydrogen and fuel cell technologies as a result of the partnership between industry and the Government of Canada. The return on those early government investments is 2,000 jobs, a solid base of tax revenues, a more diversified economy and technology companies that can contribute to the creation of a cleaner and healthier environment. Canadian hydrogen and fuel cell companies are clean energy R&D leaders with approximately \$200 million invested per year from 2003 to 2008. A recent government sponsored economic study completed in March 2010 conservatively estimates that by 2020, the Canadian hydrogen and fuel cell sector will create 14,500 jobs and achieve revenues of \$1.2 billion: #

Economic Impact on Canada - Hydrogen Fuel Cell Sector

Year 2020	Low	High	
Revenues (\$mm)	\$1,242	\$6,147	Source: "Assessment of the Economic Impact of the Canadian Hydrogen and Fuel Cell Sector" March 26, 2010 - Ference Weicker & Company Ltd.
Direct Employment	6,291	18,954	
Indirect Employment	8,178	24,640	
Total Jobs Impact	14,469	43,594	
Wages Paid (\$mm)	\$650	\$1,938	

In April 2009, a report prepared by the Science Technology and Innovation Council titled "State of the Nation 2008 - Canada's Science, Technology and Innovation System", identified fuel cells as one of the science and technology priorities on which Canada should focus.

Hydrogen and Fuel Cell Technologies

The potential applications for hydrogen and fuel cells are countless — from running a wide variety of vehicles, to being used as sources of backup power, to powering cellular phones and laptops, to heating of hospitals and homes.

In 1997, fewer than 20 companies maintained hydrogen and fuel cell activities. Today, the Canadian hydrogen and fuel cell sector features over 100 stakeholders, including a number of core technology developers. Canadian capabilities in hydrogen and fuel cells extend across the country in Victoria, Vancouver, Calgary, Toronto and Montréal. Clusters of hydrogen and fuel cell companies, suppliers, infrastructure developers and service providers help accelerate commercialization by pooling talents and focusing efforts. Canadian hydrogen and fuel cell technologies are being sold today into product applications such as forklift trucks (U.S.), telecom backup power systems (U.S. and Germany), residential co-generation systems (Japan), and transit buses (Canada, U.S. and Europe).

State of the Nation 2008, Canada's Science, Technology and Innovation System

Science, Technology and Innovation Council Pg. 38

The Government of Canada is an important partner for the hydrogen and fuel cell sector. The Science Technology and Innovation Council's report properly reflects the Government of Canada's view on the technology as witnessed by recent public comments by the Minister of Industry.

"We also see the tremendous potential of hydrogen and fuel cell technology — technology we are already exporting to the United States, Asia, Europe and Oceania. Some of that technology was on display at the recent Winter Olympic and Paralympic Games in Vancouver, which, I am proud to say, were the greenest on record."

The Honourable Tony Clement, Minister of Industry

North American Competitiveness, Innovation and Clean Energy Conference
San Diego, California April 14, 2010

Canadian Hydrogen and Fuel Cell Sector Composition

Canada is recognized as a leader in the global hydrogen and fuel cell sector. Our expertise builds on strong achievements made over the past several decades. It must be noted however, that the Canadian sector, like the worldwide hydrogen and fuel cell sector is still evolving, with much potential for growth through new product development and through commercialization.

In Canada the hydrogen and fuel cell sector is characterized by small and medium sized companies engaged exclusively in the sector, with a wider range of companies involved in supportive roles. The large companies in this sector tend to be multinationals. Interest in these emerging technologies is growing as more businesses, investors and countries recognize the economic opportunities.

This increased interest is stimulating commercialization and leading to a more competitive environment for all involved. In Europe, Japan, and the United States, larger "end-user" organizations, usually large companies, are becoming more involved in the sector to demonstrate the technology in their own product lines or to enter new market areas.

Canada's hydrogen and fuel cell sector has world-leading capabilities in a number of areas, including:

- Hydrogen production, purification, distribution, storage, and fueling;
- Fuel cell stack and fuel cell systems development (multiple fuel cell types);
- Product development and systems integration;
- Balance of plant and parts production;
- Research and development;
- Manufacturing systems; and,
- Financial, engineering and consulting service suppliers.

Unlike the traditional research model for Canada, most Canadian research and development in the hydrogen and fuel cell sector has been carried out by the private sector with some support from the federal government. However, during the past 8 years there has been increased activity in the academic community and there are now several national research networks committed to new hydrogen and fuel cell technology development. Continued research and development by public and private sector participants will be critical to maintaining Canada's leadership position in the commercialization of hydrogen and fuel cell products and systems.

There are currently up to 20 Canadian companies whose primary focus is hydrogen (production, purification, distribution, storage, fueling), fuel cell stack (micro, stationary or mobile) or systems development, or production and systems integration. More than 60 other firms and organizations are either heavily involved in the sector or have some interest in developing hydrogen and fuel cells or related activities. An end user, early adopter market is developing as a result of technology improvements, competitive offerings, environmental benefits, and government purchase incentives.

Projected Global Markets for Hydrogen and Fuel Cells

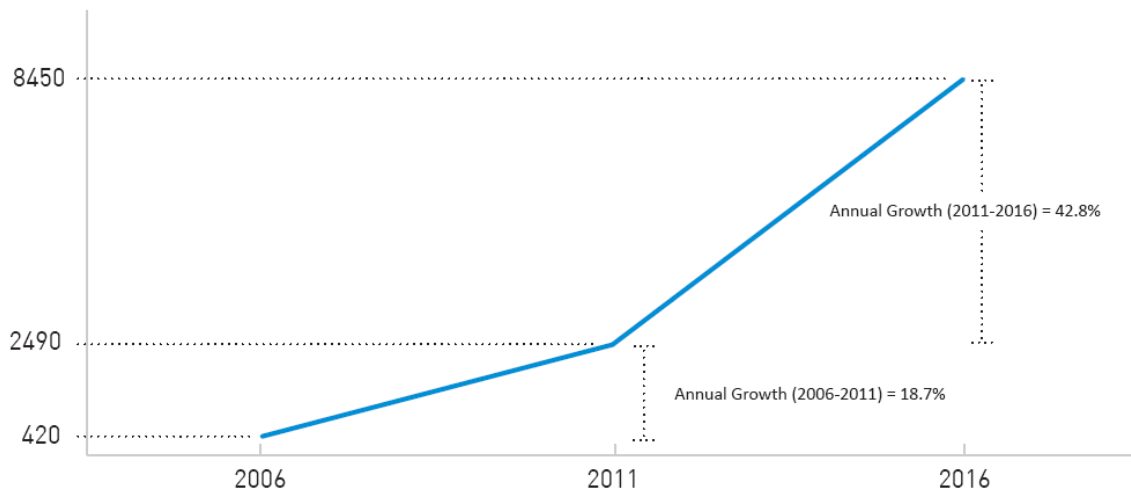
Global commercialization of hydrogen and fuel cell systems is increasing, attributable to both changes in global energy needs and the unique value characteristics hydrogen and fuel cells offer. Demand for the technology is being driven by:

- Energy efficiency, reliability, cost and quality;
- Environmental benefits (reduction of local pollutants and greenhouse gases) Energy security through locally produced “clean independent energy”; and,
- Business innovation, job creation and exports.

Continued demand for energy from sustainable sources is creating markets for hydrogen and fuel cells. The global demand for hydrogen and fuel cells is projected to increase strongly.

Global Commercial Fuel Cell Demand (\$ millions)

Source: Freedonia Group, 2007



There are several market areas in which Canada can exploit major opportunities:

Hydrogen Infrastructure - These include hydrogen production from waste streams; electrolysis; steam methane reforming; thermonuclear processes or nuclear off-peak electricity coal gasification and biomass, wind power and other renewable. Strengths also exist in purification, distribution, storage and fueling systems. Canada's long history in producing industrial hydrogen should benefit a transition to hydrogen energy.

Stationary Power - Stationary fuel cells, both hydrogen-powered and high efficiency, near zero emission fossil fuel powered, can be used in a variety of applications, including off-grid and backup power, residential electricity and heating, and distributed power generation.

Mobile Power - Mobile fuel cell applications include hydrogen-powered automobiles, trucks, buses, locomotives, industrial support vehicles such as forklifts, and marine transportation. Hydrogen internal combustion engines could be an additional transitional technology for establishing a mass market for fuel cell automobiles and commuter vehicles.

Micro Fuel Cells - In this sector, our early market opportunities are for consumer and industrial applications such as laptop devices, cell phones, scanners, communication handsets, and for use in military applications. Engineering and Integration- strength exists with companies that integrate fuel cells with hydrogen storage and balance of plant processes. Canadian companies are also actively involved in fueling station design and construction. Process engineering firms design hydrogen production plants as well as hydrogen recovery from waste streams.

Codes, Standards and Safety - Canada has an active role in international codes and standards development and in knowledge on safety and handling of hydrogen. A Canada Hydrogen Installation Code has been developed for assisting organizations in addressing multiple aspects of installing hydrogen demonstration or commercialization programs. This Installation Code is transferable to other jurisdictions with some modification due to local circumstances.

About the CHFCA

The CHFCA is a national, non-profit association headquartered in Vancouver, BC, with an office in Ottawa, ON. It was formed in January of 2009 as a result of a merger between the Canadian Hydrogen Association and Hydrogen & Fuel Cells Canada. The CHFCA is the prime source of services and support to corporations, academic institutions and business alliances, promoting, developing, demonstrating and deploying hydrogen and fuel cells and related products and services in Canada. CHFCA provides its products and services to more than 70 members, who represent all aspects of hydrogen and fuel cell development and related activities in Canada.

Contact: John W. Tak
President and CEO
Canadian Hydrogen and Fuel Cell Association (CHFCA)
4250 Wesbrook Mall
Vancouver, BC V6T 1W5

Direct: +1-604-822-9849 jtak@chfca

Appendix 1
Estimated Uptake and Costs of Hydrogen and Fuel Cell Policy Requests

Estimated Cost of Fuel Cell Purchase Incentive (Policy Request 2)						
<i>Stationary Market</i>						
Year	Installed kW	Cumulative kW	Installed Cost / kW	Total Yearly Investment in Cleantech	Total Cumulative Investment in Cleantech	ITC @ \$3000 / kW (up to 30%)
2011	1,200	1,200	\$5,500	\$6,600,000	\$6,600,000	\$1,980,000
2012	2,400	3,600	\$5,000	\$12,000,000	\$18,000,000	\$3,600,000
2013	4,800	8,400	\$4,800	\$23,040,000	\$40,320,000	\$6,912,000
2014	4,800	13,200	\$4,700	\$22,560,000	\$62,040,000	\$6,768,000
2015	8,900	22,100	\$4,500	\$40,050,000	\$99,450,000	\$12,015,000
Stationary Market Total						\$31,275,000
<i>Lift Truck and Backup Power Markets</i>						
Year	Installed kW	Cumulative kW	Installed Cost / kW	Total Yearly Investment in Cleantech	Total Cumulative Investment in Cleantech	ITC @ \$3000 / kW (up to 30%)
2011	220	220	\$5,500	\$1,210,000	\$1,210,000	\$363,000
2012	1,375	1,595	\$5,000	\$6,785,000	\$7,975,000	\$2,062,500
2013	2,750	4,345	\$4,800	\$13,200,000	\$20,856,000	\$3,960,000
2014	5,500	9,845	\$4,700	\$25,850,000	\$46,271,500	\$7,555,000
2015	11,000	20,845	\$4,500	\$49,500,000	\$93,802,500	\$14,850,000
Lift Truck and Backup Power Total						\$28,990,500
<i>Total of All Markets</i>						
Year	Installed kW	Cumulative kW	Installed Cost / kW	Total Yearly Investment in Cleantech	Total Cumulative Investment in Cleantech	ITC @ \$3000 / kW (up to 30%)
2011	1,420	1,420	\$5,500	\$7,810,000	\$7,810,000	\$2,343,000
2012	3,775	5,195	\$5,000	\$18,875,000	\$25,975,000	\$5,662,500
2013	7,550	12,745	\$4,800	\$36,240,000	\$61,176,000	\$10,872,000
2014	10,300	23,045	\$4,700	\$48,410,000	\$108,311,500	\$14,523,000
2015	19,900	42,945	\$4,500	\$89,550,000	\$193,252,500	\$26,865,000
Total for All Markets						\$60,265,500
Total Cost of Policy Request 2 (2011-2016)						\$60,265,500
Estimated Cost of Hydrogen Infrastructure Investment Incentive (Policy Request 3)						
Year	Number of Fueling Stations	Cost of Fueling Stations	Cost of Industry Share	Cost of Government Share	Cumulative Government Share	
2011	2	\$1,500,000	\$750,000	\$750,000	\$750,000	
2012	3	\$2,250,000	\$1,125,000	\$1,125,000	\$1,875,000	
2013	3	\$2,250,000	\$1,125,000	\$1,125,000	\$3,000,000	
2014	4	\$3,000,000	\$1,500,000	\$1,500,000	\$4,500,000	
2015	5	\$3,750,000	\$1,875,000	\$1,875,000	\$6,375,000	
Total Cost of Policy Request 3 (2011-2016)						\$6,375,000
Estimated Cost of Utility-Scale Hydrogen & Fuel Cell Funding (Policy Request 4)						
Year	# of Utility Scale Projects	Cost of Utility Scale Projects	Cost of Industry Share	Cost of Government Share	Cumulative Government Share	
2011	3	\$12,000,000	\$8,000,000	\$4,000,000	\$4,000,000	
2012	3	\$12,000,000	\$8,000,000	\$4,000,000	\$8,000,000	
2013	3	\$12,000,000	\$8,000,000	\$4,000,000	\$12,000,000	
2014	3	\$12,000,000	\$8,000,000	\$4,000,000	\$16,000,000	
2015	3	\$12,000,000	\$8,000,000	\$4,000,000	\$20,000,000	
Total Cost of Policy Request 4 (2011-2016)						\$20,000,000
Total Cost of CHFCA 2011 Budget ASK (2011-2016)						\$86,640,500