



The Gender Impact of Green Job Creation

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Abstract

There are many who fear a negative employment impact from measures to fight climate change. Those fears have been countered by others such as those in the BlueGreen movement who point out the potential for green job creation in replacing the jobs lost in fossil fuel and other CO² emitting industries. However, there has been little gender-based analysis of the impact of green job creation. This is despite warnings from some that “green jobs are almost entirely male, especially in the alternate energy area”.¹

This research seeks to make a start in filling the void in gender-based analysis. I look at the more general analyses around green job creation and then present evidence that I have gathered around green job creation’s gender impact. The evidence comes mostly from New Brunswick but one of the case studies comes from Nova Scotia.

The research begins by looking at various studies of green job creation. Unfortunately, none of them has looked at the issue of gender impact. Some do, however, list the types of jobs that would be created from green initiatives. Taking these lists and finding the gender breakdown of those jobs in New Brunswick with data from the 2006 Census, I am able to get an indication of the gender impact of green job creation.

This is followed by the presentation of two case studies of green initiatives- one in New Brunswick and one in Nova Scotia. The first is a case study of Efficiency New Brunswick, a government organization that “promotes and rewards the use of energy efficiency in the province”. Although achieving energy efficiency in the province is Efficiency New Brunswick’s primary goal, green job creation is also an important outcome of its work. The second case study is that of Daewoo, a plant established in 2010 and partly owned by the Nova Scotia government, which builds turbine parts for the production of green energy. From the point of view of the government, job creation and specifically green job creation would be the primary goal of this initiative. In each of these cases, I seek to determine the gender impact of the green jobs created.

Since both the data and the case studies show that the green jobs created are almost all non-traditional for women, I turn to the whole question of women in non-traditional occupations. This examination includes women in apprenticeship programs and women’s experiences in non-traditional jobs at the workplace.

Lastly, I look at the policy implications of my findings. If women are severely under-represented in the green jobs created to mitigate climate change, are there ways to counter this effect? Could women and men benefit more equally in such job creation initiatives? In this light, certain employment and training equity policy options are discussed.

¹ Linda Hirshman, Op-ed, *New York Times*, Dec. 9, 2008.¹

1. I am using “jobs with environmental benefit” as the definition of ‘green jobs’ and “any jobs created as a result of green economy initiatives” as ‘green job creation’. In specific studies that I use, the definition may vary and I will point this out as it arises.

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Introduction

While there are many who fear a negative employment impact from measures to fight climate change, such fears have been countered by those who point out the potential for green job creation to replace jobs lost in fossil fuel and other greenhouse gas emitting production. However, as important as green job creation is, there has been little analysis of its gender impact.¹ This paper seeks to address that void. Its findings can be used as a starting point for studies in other contexts.

I will be looking at the analysis around green job creation and then at evidence of its gender impact. The new evidence I present comes mostly from New Brunswick. I have chosen a case study approach in order to get behind the macro data to see what is happening on the ground. The paper begins by looking at studies of green job creation in both the United States and Canada. Unfortunately, none of these studies has looked at the gender impact of such green job creation. One study does, however, list the types of jobs that it is expected will be created. By finding the present gender breakdown of those jobs in the economy, I am able to give an indication of the gender impact that green job creation will have if no policy changes are made.

This is followed by two case studies- one in New Brunswick and one in Nova Scotia- where I have gathered evidence on the gender impact of two green initiatives. The first is a case study of Efficiency New Brunswick, a government organization that “promotes and rewards the use of energy efficiency in the province” (Efficiency NB website). The building and use of energy efficiency measures, in turn, creates jobs in the sector. The second case study is that of a plant, partly owned by the Nova Scotia government, which builds turbine parts for the production of wind energy. In each of these cases, I examine the gender impact of the green jobs created.

Next, I look at the whole question of women in non-traditional occupations, particularly in the trades, to see if there will be women prepared to work in green jobs in the future. This includes examining data on women in apprenticeship programs as well as accounts of women’s experiences in non-traditional jobs.

Lastly, I consider the policy implications of my findings. If women are severely under-represented in the green jobs created in the fight against climate change, are there ways to mitigate this effect? Could women and men benefit more equally in green job creation initiatives? In this light, certain policy options are considered.

Estimating the Gender Impact of Green Job Creation

Perhaps the seminal study in green job creation is *Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy*, published in 2008 by the Policy Research Institute of the University of Massachusetts (Pollin, Garrett-Peltier, Heintz and Scharber). The authors claim that \$100 billion of infrastructure spending for clean energy transformation could create two million jobs in the US economy over a two year period (12). In May 2010, BlueGreen Canada published a study, *Falling Behind: Canada’s Lost Clean Energy Jobs*, in which Canada’s investment record in clean energy jobs is shown

to be falling far behind that in the United States and other countries. The study estimates that had Canada matched the US spending on a per capita basis, an additional \$11 billion dollars would have been earmarked in Canada's 2009 stimulation package for clean energy. This, in turn, would have led to the creation of an additional 66,000 jobs, not including energy efficiency and transportation investment (2). Another 2012 study by BlueGreen Canada, *More Bang for our Buck*, found that for every two jobs created in oil and gas in Canada, fifteen jobs could be created in clean energy (16, BlueGreen Media Release). Even closer to home, a study published in May 2012 by Environment Northeast, *Energy Efficiency: Engine of Growth in Eastern Canada*, calculated the potential macroeconomic effects of expanded energy efficiency programs for the region as a whole and for each of the eastern provinces individually. In terms of job creation in New Brunswick, the study found that investment in energy efficiency programs could, over a twenty-eight year period, drive the creation of between 10,700 and 24,800 jobs years of employment in the province. The low estimate, 10,700 job years, is based on using just some of the potential for job creation of energy efficiency, while the high estimate, 24,800 job years, is based on using the maximum potential (29).

None of these studies considers the gender impact of the job creation but the University of Massachusetts study, in particular, is useful in that it lists the "representative jobs" that would be created from six areas of green economic investment (Pollin *et al*, 6). These areas are: retrofitting buildings, expanding mass transit and freight rail, constructing smart energy grids, production of wind power, production of solar power, and production of next generation biofuels. Each area has some eight to ten representative jobs listed.

What I have done is to take that list of representative jobs to a New Brunswick Department of Post-Secondary Education, Training and Labour representative for a gender breakdown of the holders of those jobs in the province. For example, the representative jobs listed under building retrofitting are electricians, heating/air conditioning installers, carpenters etc. The question that I am trying to answer is: Are those jobs that women do? The most recent data comes from the 2006 census. The results are presented in Table 1A in Appendix 1.

I will summarize some of the results. For the representative jobs in building retrofitting in New Brunswick in 2006, women were 10% of the managers but only 1.7% of the carpenters and 0% of the electricians, roofers and building inspectors. For wind power, NB women were 88.5% of the assemblers (not necessarily in wind power) but only 23.3% of sheet metal workers, 1.7% of construction equipment operators and 0% of millwrights, machinists and first line production supervisors. For solar power, NB women were only 6.8% of electrical engineers, 6.5% of installation helpers and labourers and 0% of electricians, industrial machinery mechanics and metal fabricators. For advanced biofuels, NB women were 50.7% of chemists (in general), 18.5% of chemical engineers but 0% of chemical equipment operators, chemical technicians and mixing and blending operators. For mass transit/freight rails, NB women were 12.7% of civil engineers but 0% of rail track drivers, electricians and skilled welders. Finally, in smart grid, although 88.5% of electrical equipment assemblers were women, NB women were only 31.6% of computer software engineers, 10.3% of operating engineers, 6.8% of electrical engineers, 6.5% of construction labour and 0% of industrial engineering technicians, machinists and

electrical line installers and repairers. In summary, these representative clean-energy jobs and the gender breakdown for those jobs in New Brunswick in 2006 show that they are non-traditional jobs for women with a very low representation of women holding them. Many of the jobs had no women in them at all.²

Case Studies

Efficiency New Brunswick

Efficiency New Brunswick (ENB) was set up in New Brunswick in 2005 “to promote and reward the use of energy efficiency in the province” (Efficiency New Brunswick website). It came out of a climate change initiative by the Eastern premiers and governors. There were thirty-two on staff at the Saint John office of Efficiency NB in 2012.³

A Crown agency, Efficiency NB offers education and incentives to NB homeowners, business and industry to persuade them to adopt energy efficiency options. The provincial incentives under the NB Existing Homes Energy Efficiency Upgrades Program originally ran parallel to federal government incentives but when the federal Energy Retrofit Program was cut in March 2011, the provincial incentives continued.

In order to be eligible for an energy efficiency grant, a homeowner or business has to be audited, a report written and the work inspected when completed. The auditing, reporting and inspecting is done by “energy advisors” working for private companies. The commercial and industrial incentives programs started in 2007. They were funded during the period, 2007-10, from a provincial Department of Environment Climate Action Fund which in turn had been funded by the federal government’s Canada Eco Trust for Clean Air and Climate Change (ENB Media Release, 2008).

The incentives, besides promoting energy efficiency, are seen to produce local economic activity and jobs. In May 2009, Premier Shawn Graham cited estimates that the average participant, by spending \$11000 on energy efficiency upgrades, had contributed, in aggregate, over \$50 million to their local communities since the program began (ENB Media Release, 2009). In April 2010, Graham’s Energy Minister claimed that the homeowner program had created jobs for local contractors and improved business in the home improvement retail sector (ENB Media Release, 2010).

²A new paper, “Quality Employment for Women in the Green Economy: Industry, Occupation and State-by-State Job Estimates”, from the Institute for Women’s Policy Research in Washington, DC (April 2, 2013), makes up somewhat for the lack of discussion on the gender impact of green job creation in the literature. It gives estimates of future green jobs for women at both the national and state levels in the US. However, it also faced the problem of the lack of data and its estimates involve much extrapolation of data and many assumptions. Two of the study’s conclusions are pertinent to the present study. First, from their estimates they conclude that “women are less likely than men to work in green jobs [three women for every ten men (29)] and are particularly underrepresented in occupations that are predicted to grow most strongly in the green sector” (Executive Summary, 1). Second, with reference to policy, they recognize the need for national and state workforce development strategies to explicitly address the issue (29).

³ Six staff positions and two programs at Efficiency NB were cut in 2013 (CBC News, 2013).

Direct jobs are created by the Efficiency NB initiative at Efficiency NB itself and at private companies employing home and building energy advisors for the incentives programs. Most importantly, however, the Efficiency NB initiative creates jobs in home and building construction companies, heating contract companies, and “energy management service provider” companies (largely engineering companies) serving the commercial and industrial sectors.

From my surveys, it is only at Efficiency NB itself where women make up the largest proportion of the workers in the green jobs created. On the other hand, there are virtually no women who have become energy advisors in the private sector under the program. Most strikingly, I found no women working in energy efficiency initiatives, except as office staff, in the construction, heating or energy management sectors.

The situation at the Efficiency NB office in 2012 is described in Table 1 below. Women are in the majority in the management, professional and administrative categories. However in the technical category, the only category which is directly energy related, men outnumber women with seven men to two women.

Table 1: Jobs at Efficiency NB by occupational category and gender

Occupational Category	Job Title	Gender	
		#M	#F
Management	Vice-President/President & CEO	0	2
	Director	0	3
	Manager	3	3
Professional	Public Outreach Officer	1	1
	HR Coordinator	0	1
	Communications Officer	0	1
	Marketing Coordinator	0	1
Technical	Commercial Energy Advisor	3	1
	Industrial Energy Advisor	2	0
	Residential Energy Advisor	1	1
	Energy Efficiency Analyst	1	0
Administrative: clerical, secretarial	Adjudicator	0	3
	Administrative Assistant	0	3
	Executive Secretary	0	1
Totals		11	21

Data provided by Efficiency NB for 2012.

The situation of energy advisors in private companies who do the energy audits for Efficiency NB’s incentives programs is described in Table 2. The ratio of male to female advisors is 29 to 3. From information that I was given in telephone interviews with staff at the companies, it seems that there has been a woman listed from time to time at several of the companies but it is questionable if there are, in fact, any women working in these jobs. The office staff in the companies, however, are all women.

Table 2: Energy Advisors in New Brunswick, 2012

Company	Office Location	Males	Females	Office Staff
Amerispec upgrades & building new	Fredericton	7	0	N/A
Enerchek upgrades & building new	Oromocto	11	1	3 women
Legacy Technical upgrades only	Bathurst	5	1	N/A
Sustainable Housing upgrades & building new	Sackville, Oromocto	4	0	2 women half-time
Canadian Home Builders building new only	Fredericton	2	1	2 women
Totals		29	3	all women

Source: Online and telephone survey, Aug. 2012.

The situation of workers in the home and building construction companies, the heating contract companies and the energy management service providers (EMSPs) is difficult to document. This is because, although the companies are listed on the Efficiency NB website, they are not certified by Efficiency NB nor are the incentives limited to these companies. Further, the companies are not all New Brunswick ones so not all of the job creation would take place in the province.

I tried to do a survey of the providers from the lists on the Efficiency NB website to find out how many women were employed in energy efficiency work. However, I received a very low response. Hence my evidence is partly anecdotal.

Most of the home renovation and construction companies are small. The workers are all men. One informant said that he had only come across one female carpenter in all of New Brunswick. The 2006 Census showed that women made up 1.7% of carpenters in the province. Heating work is often contracted out. I talked to the manager of the local office of Co-op Fuels. They contract out their heating system installation to a small company. That company has no female workers. The EMSP providers are largely engineering consultants. For example, the multinational company, Stantec, has three offices in New Brunswick. In a telephone interview, the office manager in Saint John said that previously they had one woman engineer doing work in the energy efficiency area but that she had asked to be transferred to the Halifax office when her husband had to move there. He didn't know of any other women doing such work in any of their other offices in New Brunswick. Two of the smaller EMSPs answered my survey. In both companies, the men were the service providers while their wives did the work in the office. This general situation in the environmental management service industry is further substantiated by the 2006 Census which showed that women were only 12.7% of all environmental engineers in New Brunswick.

Daewoo

In 2010, as part of the NDP Darrell Dexter government's economic development and new green economic initiative, the Nova Scotia government partnered with Daewoo Shipbuilding and Engineering of South Korea to convert the former TrentonWorks railcar manufacturing plant to one for the manufacture of towers and blades for wind turbines.

TrentonWorks, under various different names, with various owners and producing various products, had been in the community for over one hundred years. It was taken over by the provincial government from 1992 to 1995. In 1995, it was bought by Greenbier of Oregon but Greenbier closed the plant in 2007, declaring bankruptcy (*Wikipedia*, 2012; Smith, 2009). At its peak, TrentonWorks had employed 1300 workers.

The Daewoo plant opened in July 2010. The provincial government put \$60 million into the company giving Nova Scotia 49% ownership. The federal government put in another \$10 million. The deal was negotiated in collaboration with the Steelworkers union (Canadian Press, 2011).

At its peak, the new plant employed 160 workers. Some 117 of these were tradespeople, almost all welders. Of those, only two were women. As of October 2012, there were only thirty-two working at the plant. The number of women was down to one (McKay, 2012).

Curiously, at the peak of the TrentonWorks operation, there were forty women working as welders. This surprisingly high figure is explained by a 1997 HRDC training program for women welders in the plant. Before the 1997 program, there had been no women on the floor of TrentonWorks (McKay, 2012).

Training Women for Green Jobs⁴

If much of green job creation involves jobs in the trades, and women are very under-represented in the trades, what will the future hold? Are women presently receiving training in the trades? Are they entering the appropriate apprenticeship programs? Will more women be able to fill green jobs in the future than they are able to today? Unfortunately, the trends are not very positive. A Statistics Canada study found that, in 2007, women only accounted for between 1-2% of completions in apprenticeship training in most major trade groups (McMullen *et al*, 2010).⁵

Statistics Canada gives a breakdown of women's registrations in apprenticeship programs in the trades for Canada, 2006-2010. The breakdown for 2010 is given in Table 3 below. In 2010, women in Canada only accounted for 5.9% of those training as welders and

⁴ I would like to thank the following staff of the NB government for the assistance that they gave me for this part of the paper: Mary Clare White of the Women's Issues Branch and Wendy Maher, Pierre Renault and Lori Leach of the Department of Post-Secondary Education, Training and Labour.

⁵ Statistics Canada uses the two categories, 'completions' and 'registered' with reference to apprenticeships. 'Completion' is the more demanding category. However, not all tradespeople require 'completion' to be able to work in their field. Thus 'registrations' may be a more useful measure.

1.5%-3.2% of those training as carpenters, electricians, heavy duty mechanics, heavy equipment and crane operators, machinists, metal workers, millwrights, plumbers, pipefitters, steamfitters and sheet metal workers. The main anomalies are in “user support technicians” and “other trade groups” where women are 50.2% and 20.0% respectively of all workers. More information on these trade groups would be required in order to know whether these are jobs that would result from green job creation.

Table 3: Women Registered in Apprenticeship Training in Canada, 2010

Trade Group	# of women in 2010	Women as % of total in 2010
Carpenters	1371	2.7%
Electricians	2088	3.2%
Electronics and instrumentation	570	9.4%
Exterior finishing	171	1.2%
Heavy duty equipment mechanics	192	1.5%
Heavy equipment and crane operators	174	1.5%
Interior finishing	1536	8.4%
Machinists	303	2.8%
Metal workers (other)	234	2.7%
Millwrights	249	2.1%
Oil and gas well drillers, servicers, testers and related workers	6	.1%
Plumbers, pipefitters and steamfitters	927	2.1%
Sheet metal workers	192	2.2%
User support technicians	19,605	50.2%
Welders	978	5.9%
Other major trade groups	4038	20%

Source of data: Statistics Canada CANSIM Table 477-0053.

The New Brunswick Department of Post-Secondary Education and Training (PETL) provided the following data on women in apprenticeships in the province. See Table 4. In 2012, excluding the program for cooks which is by far the most popular program for women but not relevant for the green economy, women only made up 2.4% of registered apprentices in the province. This figure is up from the 1% from 2002-07 but still very, very low.

Table 4: Percentage of Female Registered Apprentices in New Brunswick, 2002-2012

As of March 31	Number of Apprentices	Number of Male	Number of Female	Percentage of Female	Number of Female (Cook Trade)	Number of Female (without cooks)	Percentage of Female (without cooks)
2002	3666	3558	108	3%	71	37	1%
2003	3643	3534	109	3%	71	38	1%
2004	3272	3190	82	3%	49	33	1%
2005	3180	3098	82	3%	47	35	1%
2006	3151	3076	75	2%	43	32	1%
2007	3401	3337	64	2%	30	34	1%
2008	3603	3517	86	2%	33	53	1.5%
2009	3905	3822	83	2%	23	60	1.5%
2010	4104	3998	106	3%	27	79	2%
2011	4157	4031	126	3%	31	95	2%
2012	4100	3961	139	3%	40	99	2.4%

Source: data provided by the Dept. of Post-Secondary Education and Training, Province of New Brunswick.

In an interview with PETL staff, it was felt that the problem in terms of the number of apprentices registered is a lack of marketing of the programs for both males and females. In the case of females, persuading them that this is the type of program, and later type of career, that they could succeed in has been a challenge.

There have been several programs put on by the department to bring women into the trades but most have had disappointing results. For example, from October 2006 to October 2009, a Pan Canadian Innovations Initiative by PETL and HRSDC (Human Resources and Social Development Canada) offered a program called Partners Building Futures. Directed at women on social assistance, the program guided women through the apprenticeship model in non-traditional jobs. With tremendous effort and much support from staff, including a pre-employment program, twenty-five women were put through phase one of the program and nineteen through phase two. However, at the completion of both phases, only ten women were registered in their fields and only six women were employed (*Partners Building Futures*, 33).

An early initiative to address the issue of young women's career choices was the introduction, in 2006, of the Wage Gap Action Plan Scholarships. The scholarships are an

incentive for both women and men “to seek careers in trades, technology and other sectors where participation to date by men and women has been limited” (Communications NB, 2010). The best results were obtained in 2012 when twenty-five of the forty-one women receiving the scholarships were in the trades. A further eleven scholarships went to men entering non-traditional fields (Communications NB, 2012). In 2013, the conditions for the scholarships were loosened, although not specifically for women, and the name was changed to Gender Equality Scholarships (*Women Femmes NB Newsletter*, 2013).

Another initiative has been a Gala for Girls event designed to introduce girls in grades nine to eleven to the skilled trades and technology sectors. The event connects girls with mentors from their communities who are working or studying in a related field. In 2012, there was a special Trades and Tech Gala for Aboriginal girls (*Women Femmes NB Newsletter*, 2012).

Women’s Experiences in Non-traditional Jobs

The whole issue of getting women into the trades goes a lot deeper than simply programs and policies. Marcia Braundy, who spent thirty-five years as a carpenter in British Columbia, has written the book, *Women, Men and Tools: Bridging the Divide*. In it, she explores the resistance by men to women entering the trades. She claims that “the right to bear tools [is] a contested site” (Braundy, 5).

She describes her experience in getting a Certification of Apprenticeship in 1981:

It had required great tenacity to overcome the pain, resistance, and harassment I had experienced to achieve completion of my apprenticeship: the daily harassment of pornographic drawings on the blackboard with my name on them at NLC pre-apprenticeship training in Dawson Creek; the crotch-shot posters of women on the back wall of the fourth-year classroom at BCIT; the twisted framing square with the C word in large print on my desk just before I went to take the Interprovincial Exam (18).

She claims that not much has changed. In her study, she explores what may be underneath the resistance. Explaining her approach, she says:

If I can understand the fears that lead to an often ferocious resistance to women working alongside them [men], and reflect this in ways that are accessible and have emotional as well as intellectual impact, it is possible that some adjustment could occur, and those women who choose these fields in the future can find a more welcoming environment (9-10).

In the study, she conducts nineteen videotaped interviews with male and female tradesworkers, youth educators in technical fields, and innovators and consultants implementing equity initiatives:

I have chosen to focus attention upon resistance by institutional and union gatekeepers, and front-line workers. Most of these people are men, often white, working-class and middle-class tradesworkers, technicians, technologists, engineers and those among them who have become teachers and administrators. They see their own skill development as an essential component of their manhood (9).

Policy Approaches

Getting more women into employment in non-traditional occupations seems to require special equity programs/quotas in employment and training that are monitored and enforced. Without programs, the number of women in non-traditional occupations remains very low. Two studies from the late nineties allow a contrast of equity programs. The first study involves the Hibernia construction program in Newfoundland starting in 1997 (Hart and Shrimpton, 75). Although there was the equity program for federal contractors involved, it was unsuccessful due to unworkable implementation plans. In contrast, in a Vancouver Island Highway Project (VIHP) in British Columbia, which also started in 1997, the equity program was highly successful (Cohen and Braid, 7). In the VIHP, equity hires, which in this case consisted not only of women, were made a condition of employment on the project and the government made sure that the hires were implemented. The project achieved an over 22% equity hiring rate at peak periods (Cohen and Braid, 72).

In the Trenton program in Nova Scotia by HRDC described earlier, which also took place in the late 1990's, some forty of the welders in the plant were women. Nothing like this has been achieved before or since in the region. This also seems to indicate that a program is required to change anything.

Susan Moir of the University of Massachusetts in Boston, has written the paper "Unfinished Business: Building Equality for Women in the Construction Trades". In it, she discusses how, despite the existence of a US law in effect since 1978 that women must make up 6.9% of contractors' work hours, the policy has been ignored (Executive Summary, n.d.). What is required to change the situation, she claims, is effective enforcement of the law involving monitoring, tracking and reporting of both contractors and subcontractors. She sets a goal for the United States of women making up 50% of contractors' work hours in the construction workplace by 2028 (6).

Conclusion

In this paper, while strongly supporting arguments for the need for green job creation, I have attempted to provide evidence to show that great care must be taken by policymakers to avoid a very negative gender impact from such job creation. Most of the jobs are in the trades and the trades are non-traditional occupations for women. The evidence that I have gathered- from New Brunswick as well as some from Nova Scotia and Canada as a whole- shows that given women's current patterns of participation in jobs and training in the trades, almost none of the green jobs created would go to women,

either now or in the future. We need equity programs both on the job and in training and those equity programs need to be strictly monitored, tracked, reported and enforced. Only with such equity programs will there be any chance for women to get a reasonable share of the green jobs created.

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APPENDIX 1, Table 1A

**GREEN JOB CREATION: 'REPRESENTATIVE JOBS' IN SIX SECTORS
MALE/FEMALE BREAKDOWN FOR NEW BRUNSWICK 2006¹**

Green Sector: Representative Jobs²	NOC³	Males (% of total)	Females (% of total)
Building retrofitting			
electricians	7241	99.3	0.0 ⁴
heating/air conditioning installers (residential home builders and renovators) ³	0712	94.0	6.0
carpenters	7271	99.3	.7
construction equipment operators (heavy equipment operators)	7421	98.3	1.7
roofers	7291	97.3	0.0
insulation workers	7293	88.3	10.0
carpenter helpers	7611	93.6	6.5
truck drivers (industrial truck drivers)	7411	98.4	1.6
construction managers	0711	90.0	10.0
building inspectors	2264	98.2	0.0
Wind power			
environmental engineers (civil engineers)	2131	87.3	12.7
iron and steel workers and industrial mechanics (labour in metal fabricating)	9612	76.1	23.9
millwrights (construction millwrights and industrial mechanics)	7311	99.4	0.0
sheet metal workers (labourers in metal fabricating)	9612	76.1	23.9
machinists	7231	98.6	0.0
electrical equipment assemblers (electronic equipment assemblers)	9483	15.4	88.5
construction equipment operators (heavy equipment operators)	7421	98.3	1.7
Industrial truck drivers (truck drivers)	7411	98.4	1.6
industrial production managers (senior managers- goods production, utilities, transport)	0016	90.2	9.8
first-line production supervisors	7211	88.9	0.0

(supervisors, machinists and related occupations)			
Solar power	NOC	Males (% of total)	Females (% of total)
electrical engineers	2133	91.8	6.8
electricians	7241	99.3	0.0
industrial machinery mechanics (heavy duty equipment mechanics)	7312	100.0	0.0
welders (skilled welders)	7265	99.1	0.9
metal fabricators	7263	93.6	0.0
electrical equipment assemblers (electronic equipment assemblers)	9483	15.4	88.5
construction equipment operators (heavy equipment operators)	7421	98.3	1.7
installation helpers (other trades)	7612	93.6	6.5
labourers	7612	93.6	6.5
construction managers	0016	90.2	9.8
Advanced biofuels			
chemical engineers	2134	82.2	18.5
chemists	2112	49.3	50.7
chemical equipment operators	9421	93.3	0.0
chemical technicians (industrial engineers and manufacturing technologists and technicians)	2233	97.0	0.0
mixing and blending machine operators	9421	93.3	0.0
agricultural workers	NA		
industrial truck drivers	7411	98.4	1.6
farm product purchases	NA		
agricultural and forestry supervisors	NA		
agricultural inspectors	NA		
Mass transit/freight rail			
civil engineers	2131	87.3	12.7
rail track layers (railway and motor transport labourers)	7622	90.9	0.0
electricians	7241	99.3	0.0
welders (skilled welders)	7265	99.1	0.9
metal fabricators (labourers in metal fabrication)	9612	76.1	23.9
engine assemblers (machine fitters)	7316	100	0.0
bus drivers (truck drivers)	7411	98.4	1.6

dispatchers	NA		
locomotive engineers	NA		
rail, road conductors	NA		
Smart grid	NOC	Males (% of total)	Females (% of total)
software engineers (computer software engineers)	2173	70.2	31.6
electrical engineers	2133	91.8	6.8
electrical equipment assemblers (electronic equipment assemblers)	9483	15.4	88.5
industrial equipment technicians (industrial engineering technicians and manufacturing technologists and technicians)	2233	100.0	0.0
machinists	7231	98.6	0.0
team assemblers	NA		
construction labourers	7611	93.6	6.5
operating engineers (industrial and manufacturing engineers)	2141	89.7	10.3
electric power line installers and repairers (electric power line and cable workers)	7244	97.4	0.0

¹ The data is from the *2006 Census*, Statistics Canada.

² The representative jobs for each sector are from Robert Pollin, Heidi Garrett-Pelletier, James Heinz and Helen Scharber, *Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy*. Centre for American Progress, Political Economy Research Institute (Sept. 2008), p 6.

³ The occupational description in brackets is from the *Census*. The next column gives the corresponding NOC (National Occupational Classification).

⁴ Numbers may not add to 100 due to rounding to the nearest 3 by Statistics Canada.