Planning for the Transition in a Carbon Constrained World

Lessons from the Literature for Saskatchewan

The Need for a Planned Transition

Many discussions around climate change policy in Canada and Saskatchewan centre around achieving our national goal of 30% below 2005 emission levels by 2030. It is important to recognize however that **this target is only the first step in Canada's pledge to achieve net zero emissions between 2050 and 2100**. Without global action to reduce greenhouse gas emissions to near zero, the global average temperature could rise 4 degrees Celsius by the end of the Century resulting in devastating consequences such as significant sea-level rise and flooding, declining food stocks and extreme heat waves (World Bank, 2012).

While the transition to net zero will take decades, the Intergovernmental Panel on Climate Change has presented **a carbon budget that would allow only 20 to 30 per cent of the world's proven fossil fuel reserves from being burned to make the internationally agreed upon 2 degree target** (McGlade and Ekins, 2015). This means continuing to invest in these resources will result in stranded assets. Simultaneously, governments and industries are also contending with increasingly less social acceptance of fossil fuel based energy sources.

Within the constraints of this physical reality, a *planned* transition to a low-carbon future can reduce costs and improve quality of life in the long-run.

A Justice-Based Transition

Bowen (2012) notes that this kind of transition will be **most difficult for regions that already have a economy developed around fossil fuels**. Pollin and Callaci (2016) state that "workers and communities whose livelihoods depend on the fossil fuel industry will unavoidably lose out in the clean energy transition….[u]nless strong policies are advanced to support these workers, they will face layoffs, falling incomes, and declining public-sector budgets to support schools, health clinics, and public safety." (p.89)

Climate change policies will inevitably impose costs, and it is unfair to impose these costs disproportionately upon a specific segment of the population. (Pollin and Callaci, 2016; Tvinnereim and Ivarsflaten, 2016) Rathzel and Uzzell (2011) note that trade unions have been slow to incorporate climate change into their agendas, and the environmental movement has not done a good job of recognizing the legitimacy of fossil fuel workers concerns.

A justice-based transition is not only just, it is strategic, as workers will become opponents to climate action if they are not treated fairly in climate change policy (Pollin and Callaci, 2016; Alberta Federation of Labour, 2017).

Mixed Evidence

The Story of Climate Policy and Jobs

Key Message

The evidence about the impact of climate policy on employment is mixed, therefore a regional study to take into account the Saskatchewan context is recommended.

The evidence about the impact of climate policy on employment is mixed. Most research on job creation potential is **not comparable** because of differences in geographic location or sectors, the handling of gross versus net effects and different underlying assumptions about policies and economic growth (GHK, 2009 in Bowen (2012)). Scale of analysis – firm level, nation levels, sector level – can also influence results (Wagner, 2004 in Rathzel and Uzzell (2011)). Consistent measurement is generally a problem because there is no agreed-upon definition of "green jobs" (Bowen, 2012). **It would therefore be useful for the Saskatchewan Government to initiate a regional study on the employment impacts of a planned transition, able to take into account the Saskatchewan context.**

Many studies predict a net increase in jobs, but disagree on the time horizons of job creation. For example, Fankhauser, Sehlleir and Stern (2008) suggest that more jobs could be created in the short-term as renewables come on line and are less efficient than fossil fuels, then efficiency gains will take effect and bring down costs (and jobs). To act within our carbon budget, long-term economies will have to adjust structurally, and they note that such episodes of 'creative destruction' are often associated with innovation, job creation and growth. Lambert and Silva (2012) also suggest that more employment opportunities will be created in the short term due to construction and installation opportunities, but that the availability of these positions will eventually decline during the operation and maintenance phase of projects. Ho *et al.* (2008) in Bowen (2012) however, contend that short term employment losses (in fossil fuel intensive industries) are likely to mirror output decline, but in the longer term, gains in other industries would fully offset those losses. In the context of Australia, Pearce and Stillwell (2008) ask, "will the sectors where new job growth occurs more than compensate for the declines in the less ecologically sustainable sectors?" (p.125). Drawing on modelling by Hatfield-Dodds *et al.* (2008), Diesendorf and Denniss (2004) and the Allen Consulting Group (2003), results suggests that job losses would be more than compensated for in the medium term. Blum and Legey (2012) in Kayani (2015) also suggest that the adaptation of favourable technology and policies would lead to a net increase in employment, but do not indicate on what time horizon. **These results suggest particular attention should be paid to the time horizon of job losses and gains in transition planning.**

One such province specific study is undertaken by the Mowat Centre and Smart Prosperity Institute for Ontario. In an October 2017 publication, policy researchers analyze recent trends in Ontario's economy, make projections about which sectors will expand or compress in a green transition and make several policy recommendations that could be used to support a Just Transition Strategy in Ontario:

http://institute.smartprosperity.ca/sites/default/files/decentworkinthegreeneconomy.pdf

Key Message

The literature generally concedes that energy efficiency and renewable energy create more jobs per MWh and per dollar of investment.

In the USA, Kammen, Kapadia and Fripp (2004) examine employment opportunities created by different types of energy mix scenarios (assuming manufacturing occurs within the USA). Three scenarios assume 20% of electricity comes from renewables by 2020, one scenario tracks 100% natural gas by 2020, and the last scenario is a fossil fuel business-as-usual scenario to 2020. Results are shown in the table below. Each of the first three scenarios shows at least **a doubling of the overall number of jobs compared to the business as usual fossil fuel scenario**.

Scenarios	Average employment associated with each scenario (jobs)		
	Construction, Manufacturing, Installation	O&M and Fuel Processing	Total Employment
Scenario 1: 20% Renewable Portfolio Standard (RPS) by 2020 (85% biomass, 14% wind energy, 1% solar PV)	52,533	111,136	163,669
Scenario 2: 20% Renewable Portfolio Standard (RPS) by 2020 (60% biomass, 37% wind energy, 3% solar PV)	85,008	91,436	176,444
Scenario 3: 20% Renewable Portfolio Standard (RPS) by 2020 (40% biomass, 55% wind energy, 5% solar PV)	111,879	76,139	188,018
Scenario 4: Fossil Fuels as Usual to 2020 (50% coal and 50% natural gas)	22,711	63,657	86,369
Scenario 5: 20% Gas Intensive by 2020 (100% natural gas)	22,023	61,964	83,987

Table ES–2: Comparison of the estimated employment created by meeting the equivalent of 20 percent of current U.S. electricity demand via and expansion of fossil or renewables-based electricity generation.

Wei *et al.* (2010) complete a macroeconomic study also modelling job creation in the USA energy sector between 2009 and 2030. They conclude that relative to fossil fuels, **renewable energy generates more jobs per unit of energy delivered** and that solar photovoltaics has the largest job creation potential. They further conclude that specific energy efficiency measures combined with 50% of electricity produced by low carbon energy sources (including some nuclear and CCS) can create **4 million job-years by 2030 in the USA**.

Similarly, Frondel *et al.* (2010) in Kayani (2015) find that **renewable energy plants create 1.7 to 14.7 times more jobs relative to natural gas plants** and around 4 times more than the coal powered electricity plants for every MW installed. Van den Berge (2010) examines employment in the context of the "Green4sure" energy plan which aims to reduce CO_2 emissions by 50% by 2030 for the Netherlands. In the energy sectors, it is predicted Green4sure could contribute to a loss of 1000 jobs (0.01% of jobs in the Netherlands), while an increase of the share of renewables in the energy grid and aggressive energy efficiency programs could create between **18,000 and 22,000 new jobs by 2030**.

Key Message

Renewable energy and associated job creation can contribute positively to economic growth but requires considerable investment.

Some research suggests that renewables contribute positively to economic growth**.** In a regression analysis of 25 OECD countries, Apergis and Payne (2014) find that **renewable energy consumption per capita has a positive and statistically significant impact on real GDP per capita**. Kanellakis, Martinopoulos and Zachariadis (2013) in Kayani (2015) find that the **renewable energy industry in Europe has already added 0.6% to GDP**, Generally, these studies suggest employment and economic gains from climate change policies. Jaeger *et al.* (2011) find that **increasing ambition from a 20% reduction to a 30% reduction from 1990 levels increases the European GDP by 0.6% per year**, and generates an additional **6 million job opportunities**.

Key to these "optimistic" (p.221) outcomes Kayani (2015) suggests is a **significant increase in investment** of an additional $842 Billion (4% of GDP). **Indeed, job creation, alongside significant reductions in greenhouse gas emissions, requires considerable investment.** In Bowen (2012), McKinsey & Company (2009) estimates that the annual incremental investment costs required to get the global economy on to an **appropriate low-carbon trajectory would be $320 billion euros by 2015**. According to Bowen (2012), the IEA (2008) and UNFCCC (2007) suggest a similar figure for the incremental costs of power generation in strong climate-change mitigation scenarios. The Institute and Center for American Progress presents a scenario they believe would reduce US emissions **40% by 2035 and result in a net increase of 2.7 million jobs** (Brecher, 2015). They estimate this achievement would require **$200 billion spent annually** on clean energy.

Key Message

Alternative energy sources are not without challenges, but the literature suggests that appropriate policy intervention can anticipate and respond to these problems.

Others argue that there could be **net job losses and employment challenges** with pursuing environmental policy (Morriss *et al*. 2009, Michaels and Murphy 2009, Hughes 2011, Alvarez *et al.* 2010 all in Bowen 2012). Kayani (2015) for example, acknowledges that **industries with high carbon activities would experience the highest losses** (p.222). Babiker and Eckaus (2007) suggest that **inflexible wage policies or barriers to the reallocation of workers between sectors can lead to net job losses** – although these can potentially be reduced via revenue recycling from a carbon pricing scheme. For example, some research has suggested that a reduction in payroll tax can mitigate negative impacts on employment.

While green job studies tend to optimistically proclaim the job potential of renewables, this is because renewable energy sources are more **labour intensive** compared to other industries – i.e. **less efficient per worker** (Frondel *et al.*, 2010 in Kayani 2015). Michaels and Murphy (2009), in Kayani (2011), argue that employing **more workers is more costly** and would **decrease the output potential of the economy**, reducing overall economic growth. They suggest the **service industry would suffer drastically** and energy intensive industries would be burdened with **higher energy costs**, and ultimately slow economic activity. Similarly, Fankhauser, Sehlleir and Stern (2008) note that high levels of labour intensity implies **lower productivity** and **less efficiency** compared to conventional energy sources. With high capital and labour expenses, renewable energy tends to be more **expensive, with a shorter lived infrastructure life cycle and intermittency issues**. This is important, the authors argue, because it may mean that it is not profitable for private investors to re-allocate money into new strategies. Michaels and Murphy (2009) also note that **job destruction** associated with conventional energy sources are **typically omitted in estimates of job creation**. Fankhauser, Sehlleir and Stern (2008) agree that labour is relatively inflexible in the short term, thus climate policies may create **transitional unemployment**.

Generally, Bowen (2012) remains skeptical of many "green job" studies, arguing that many of them handle job creation without adequate treatment of macro-economic trends, fail to fully cover the costs and benefits of certain activities, and rarely take into account the effects of higher real energy prices. There are also not many studies that focus **on strategies other than job creation from alternative energy**, such as government spending for job creation in sectors with lower capital requirements such as **education and health services**.

Key Message

Regardless of the challenges, including workers explicitly in the narrative about transition planning is more likely to increase support.

Rathzel and Uzzell (2011) state that although there have been a lot of macro-analysis and high level reports suggesting a win-win situation for the environment and jobs in a "green economy", the perception of workers has been excluded from most analysis. Survey data has shown that **workers are more likely to be influenced by industry arguments that environmental regulations such as carbon budgets will force them to make workers redundant, or force reduction or relocation of production**. However, Tvinnereim and Ivarsflaten (2016) find that while support for renewable energy from organized fossil fuel business interests is generally low, **individuals who work in the fossil fuel industry are generally as supportive of renewable energy as the general population**. With a regression analysis of data from Norway, these authors show that the distribution in the costs and benefits resulting from different climate change policies is an important explanatory variable in support for climate policy. Fossil fuel workers were much **less likely to support policies that imposed high costs on the fossil fuel workforce** such as reducing oil production, postponing significant exploration work or raising taxes on oil and gas exploration. Other policies with more ambiguous or widespread costs enjoyed a similar amount of support from fossil fuel workers and the general population (carbon capture and storage has slightly higher support from fossil fuel workers, but not significant).

Rathzel and Uzzell (2011) find that **trade unions are more actively engaging in the climate change debate**, and examine **four common discourses** that form the basis of this engagement. All of these discourses envision workers as actors who can intervene and change society. **Accessing these types of discourses on a regional level can contribute to relationship-building to support a transition**.

Mixed Evidence

Strategic planning and government intervention are necessary for a successful transition.

Consistent policy and targets create **certainty**, attracting **increased investment**.

Policy is required to ensure a smooth and justice-based transition to other employment for those whose jobs would be eliminated (Pearce and Louie, 2016; Alberta Federation of Labour, 2017; Pearce and Stillwell, 2008).

Changes to our energy infrastructure will cause **structural unemployment** (Fankhauser, Sehlleir and Stern, 2008). Babiker and Eckhaus (2006) and Bowen (2012) suggest **labour market policies** to counteract unemployment in negatively affected sectors. To ensure coordination, **governments should play a planning role**. This has been a commitment made by the current Federal government in Canada and other regions, such as in Alberta (Alberta Federation of Labour, 2017).

Planned transitions are not a new concept and have been pursued to varying levels of success in other jurisdictions. The Alberta Federation of Labour and Coal Transition Coalition (2017) detail a numbers of such instances.

CASE 1

Centralia, Washington

In Centralia Washington, the closure of two large coal-fired boilers planned for 2020 and 2025 was expected to have a significant adverse impact on the surrounding communities. The plant employed 300 workers and 400 contractors, at average annual wages of $88,000.

A just transition became the central principle in the closure of the plant. The company, unions and government worked together to make this happen. 40% of workers would retire before closure and the remaining 60% has 8 to 12 years to plan for the future.

In this case, transition funding and planning were directed into three funds managed by a board that involved community development, education and re-training, and clean energy technology. TransAlta supplied $55 million to the endeavour.

Alberta Federation of Labour (2017)

CASE 2

Madison, Wisconsin

During a transition from a coal to a natural gas plant in Blount Street Madison, Wisconsin, the company and unions compromised to cover workers affected by the change which was supposed to lead to 70 layoffs.

Bargaining led to a collective bargaining agreement between the company and union which included several provisions including job guarantee for senior workers, company-sponsored training, tuition reimbursement, preferential hiring and wage protection outside of the company. For those workers that did have to be let go, the agreement guaranteed outplacement services ($3000/worker), severance pay, retirement severance options, and job preference at other facilities owned by the company. In this case the transition period was lengthy, which was identified as a key to success.

Alberta Federation of Labour (2017)

Opportunities in Canada

Starting with Coal

Saskatchewan coal mines (operated by Sherritt Coal) currently employ about **650 people**: 450 people in the Estevan mines and 150 at Coronach (Saskatchewan Southeast Enterprise Region, 2017).

Alberta has 3150 jobs directly related to coal power generation – 80% in mining and processing and 20% in power plants (Jeyakumar, 2016).

Pearce and Louie (2016) note that only **30% to 35% of total coal mining jobs are industry specific**. For coal-fired **power plants**, they estimate that **43% of jobs utilize skills which would allow workers to transition** to an industry such as PV solar without needing further training.

TABLE 1 Average employment over the life of a facility (jobs/MW)

	Construction, manufacturing, installation	O&M and fuel processing	Total employment
Solar PV	5.76–6.21	1.20–4.80	7.41–10.56
Wind	0.43–2.51	0.27	0.71–2.79
Biomass	0.40	0.38–2.44	0.78–2.84
Coal	0.27	0.74	1.01
Gas	0.25	0.70	0.95

Note: Ranges refer to the results of different studies. Employment is shown relative to the average installed capacity, correcting for differences in capacity factor. (Because renewable installations operate only 20% of the time, compared with 80% for fossil fuel plants, 4 MW of renewable capacity is needed to produce the same output as 1 MW of fossil fuel capacity).
Source: Kammen et al. (2006).

In Alberta there is an expectation that that the provincial government's renewables commitment (**5000 MW by 2030**) will be able to provide a **comparable amount of jobs**, especially if community-scale renewables are pursued in parallel to utility scale (by comparison, SaskPower is looking to increase renewable capacity by about **2420 MW**).

The Government of Alberta estimates their commitment will create **7200 job-years** or **500 full time equivalent** positions. The Pembina Institute, including **indirect jobs** and jobs created via the **solar industry**, estimates this commitment will create **900 to 2500 full time equivalent** positions (Jeyakumar, 2016).

Pearce and Louie (2016) recommend **coal producing regions invest in funding the cost of re-training, ideally years before the retirement of power plants**, so workers can go directly from one job to the next with no delay.

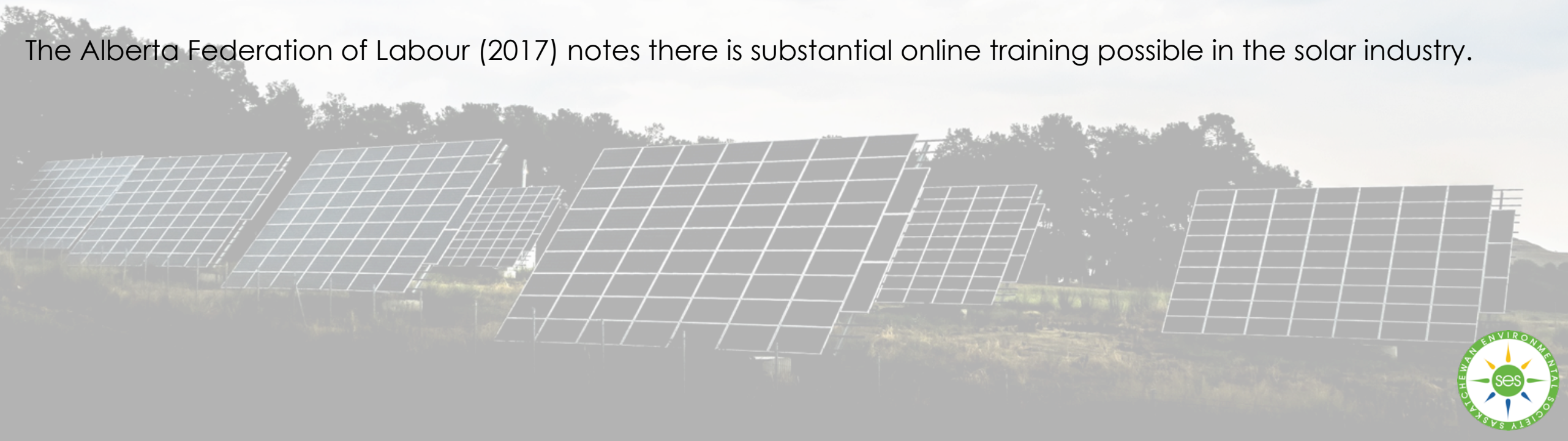
In Canada, Bridge and Gilbert (2017) estimate that a 10% increase in solar power by 2050 can create 438,350 construction jobs.

They note that in California, almost all large-scale (> 1 MW) renewable energy construction work over the past 14 years was done by union contractors or non-union contractors paying union rates. Average wage between 2002 and 2015 for large renewable energy projects in California was $36.84 per hour. Collectively, these jobs contributed almost $340 million to workers pension funds, $400 million to health benefit plans and $46 million to apprentice training programs.

Pearce and Louie (2016) examine what training is available for work in the solar photovoltaic industry in the USA and provide cost estimates for the re-training from coal plant workers and miners. Training costs vary considerably depending on the extent of the coal industry in a particular state. In all coal-producing states, the authors suggest re-training costs would range from $181 million to $649 million in the best case scenario, and $539 million to $1.9 billion in the worst case. In the best case scenario, 35% of workers will need to be retrained. Under the worst case scenario, the 35,000 non-power plant specific jobs across the USA will require re-training to be residential/small commercial solar PV installers, which is expected to cost $4295 per person resulting in a total re-training cost of about $148 million.

In states with similar coal industry employment numbers to Saskatchewan - Arizona (432) and Maryland (476) - estimates range from $870,000 to $9 million, and $958,950 to $9 million in the best and worst case scenarios respectively.

The Alberta Federation of Labour (2017) notes there is substantial online training possible in the solar industry.



In Canada, Bridge and Gilbert (2017) estimate that **25% more wind power by 2050** (including increased demand) will translate to **209,360 full-time construction jobs** across the country.

In Pearce and Stillwell (2008), Diesendorf (2004) estimates that by 2004, the **wind power** industry in the USA created more than **twice the local employment of the coal industry**. Diesendorf (2006) estimates that this figure could double or triple with strong political commitment to utilize local labour for manufacturing, installing and maintenance.

In Canada, wind power is still a small portion of national energy production but growing rapidly. In the USA, Hamilton and Liming (2010) point out that wind generating capacity has expanded dramatically and in 2010, was over 35,000 MW. In the same year, Hamilton and Liming (2010) estimate that 85,000 Americans were employed in wind and related fields. This includes actual power production as well as manufacturing of parts such as turbines, blades and towers.

In the wind industry, most jobs tend to be in the manufacturing sector, but many positions are not unique to the wind industry and skills can be acquired in other sectors. According to Hamilton and Liming (2010) potential types of jobs include **electricians, roofers, steelworkers, machinists, engineers, truck drivers, research scientists, lawyers, accountants and administrative assistants**. For most positions, individuals can be hired and then given wind-specific training (Hamilton and Liming, 2010). Some roles, such as a wind turbine service technician, require specific training.

According to CRA (2002) in van den Berge (2010), **investments in energy efficiency can lead to three to four times more new jobs** compared to investments in increased capacity in energy production. The European Commission (2005) estimates that **improvements in energy efficiency of 1% annually could lead to 200,000 new jobs** in construction and installation across Europe.

According to Bridge and Gilbert (2017), **construction work** will benefit most from Canada's climate goals. In total, they estimate our targets could generate over **3.9 million direct jobs in the building trades by 2050**, and 19.8 million jobs if induced, indirect and supply-chain jobs are included. For example, building small district energy systems in half of Canada's municipalities with populations over 100,000 would create over 547,000 construction jobs by 2050.

In terms of our built environment, net zero building will require the work of a variety of tradespeople, including masons, boilermakers, pipefitters, insulators, electrical workers, glaziers, linemen, ironworkers. Bridge and Gilbert (2017) estimate that almost **2 million direct non-residential construction jobs could be created for net zero building retrofits and green building construction by 2050**. They note a figure from a study by the world green building council which estimates that **$1.99 billion to $8.5 Billion spent of energy efficiency programs** across Canada could result in **job growth potential of between 100,000 to 300,000 jobs**.

Bridge and Gilbert (2017) estimate that a **$150 billion investment in urban transportation infrastructure could result in 245,000 direct construction jobs by 2050**.

Pearce and Stillwell (2008) outline several sectors where job growth could occur outside of **renewable energy, including sustainable water systems, biomaterials, green buildings, waste recycling, transport, agriculture, research and innovation, business services and green accounting**. Job creation in these sectors will depend on consistent government policy signals.

Principles for a Planned Transition

Principles for a Planned Transition

1. A transition should be guided by complimentary environmental, education and labour policies.

Pearce and Stillwell (2008) argue that climate change mitigation policies should be accompanied by planned transition policies, as market forces alone will not be able to address potential gaps that emerge. They recommend developing **industry, regional and labour market policies**, as well as **training and education policies** to smooth the transition.

Bowen (2012) remarks that good transition outcomes will balance prudently designed government interventions with innovations by people and companies. In a 2016 piece detailing how Alberta can make a just transition from coal to alternative forms of energy, the Alberta Federation of Labour and the Coal Transition Coalition (2016), with endorsement from nine labour unions, make several points about types of interventions that would be required in Alberta, including:

- The establishment of an **arm's length Agency** to oversee and coordinate the transition process. This Agency would also manage several programs related to the transition process, including programs related to job training and education, relocation and preferential hiring, interim support, departure packages and community programs.
- **Transitional allowances, pension-bridging or early retirement** where necessary. A database of years to retirement should be established, as should a pension building trust fund, audit of existing pensions, coverage and gaps. A plan to honour pensions should be prepared.

Van der Berge (2010) emphasizes the need for newly created jobs to be ***good* jobs**. He details a case with a Dutch trade union that refused to accept jobs with a new green energy company, because the new company did not honour the wages agreed to in the energy sector collective bargaining agreement. The case shows that workers value decent jobs over green jobs (van den Berge, 2010). The Alberta Federation of Labour (2016) agrees, recommendation that transition planning in Alberta include:

- The provision of new jobs at a **similar or equivalent rate of pay**.
- The provision of a **moving allowance**, if needed.
- **Education, training and career counseling**. Here, they suggest industries provide targeted specific training and apprenticeships and that the role of the government is to provide more general education and counseling. Free or reduced tuition, financial support and health benefits would help support this process.

This work, particularly the training and education, should begin as soon as possible. Bowen (2012) agrees, suggesting the overall welfare gain from a transition will be greater the sooner we start the process.

Principles for a Planned Transition

2. Targeted regional strategies should be a key part of a transition strategy.

The Alberta Federation of Labor (2016) makes several recommendations regarding **regional strategies**, including:

- **Strategically invest in affected communities**. Investments should be informed by a **labour market study** to ensure there are real jobs available.
- Hiring should be prioritized in the same region, within the same company or within a similar company if possible. This could be provided through a job pool or transfer program. Tailored plans should be created for specific communities and situations.

Pearce and Stillwell (2008) suggest that transitions to a low-carbon economy could be accompanied by collapses of regional economies or local communities, or dramatic declines in incomes. **Targeted regional development policies** – such as those used during the steelworks closure in Newcastle (Australia) and the Victorian Government Forestry Restructuring Program – may be applicable to regions such as the Hunter Valley in Australia which is heavily dependent on mineral-extraction. Pollin and Callaci (2016) also argue that strategic planning is essential to make sure **clean energy jobs are available where we need them**, in those communities most significantly impacted.

Principles for a Planned Transition

3. Transition should be informed by a skill assessment.

The literature points to the **inevitability of job destruction** in the short and long run (Bowen, 2012; Kayani 2015; Babiker and Eckhaus, 2007; Fankhauser, Sehlleir and Stern, 2008). Measures can be introduced to **support emissions-intensive industries in the short and medium term** – such as allowing industries to draw on government support to compensate workers (van den Berge, 2010). However, this should be implemented sparingly and strategically.

Pearce and Stillwell (2008) point to the **lack of systematic data** collection, both on **current workforce skills and future skills** required for a low carbon economy. To this end, the Australian Senate Standing Committee on Education and Employment has launched an inquiry into current and future workforce skills and training needs in a green economy.

Garforth and Medearis (2011) detail the creation of a 40-year Community Energy Plan aiming to promote investment, job growth and environmental protection in Arlington County, Virginia. Part of this plan involves an **inventory of local educational institutions such as colleges and technical schools** that can provide training for opportunities such as installation of renewable energy technologies, urban infrastructure developments, and building retrofits.

Principles for a Planned Transition

4. A transition should target more than just jobs in renewable energy.

Pearce and Stillwell (2008) and Meagher, Wilson and Dixon (2014) point to **ample potential for job creation in industries other than renewable energy**. These opportunities are typically **under-researched and under-represented** in the literature (Bowen, 2012; Pearce and Stillwell, 2008).

Principles for a Planned Transition

5. Transition support should be financially supported by both industry and government

Considering the financial underpinnings for a transition, there are a **variety of policy options**. For example, **employees could be expected to pay** for their own re-training, the **industry could finance** re-training opportunities, or the **government could establish supporting programs**.

Louie and Pearce (2010) suggest that young unskilled coal workers with jobs specific to coal mining may be most at risk during a transition; older workers will have more opportunity to retire early. They suggest that there is **precedent for the coal industry financing re-training programs the same way they are currently mandated to pay into a fund for reclamation or institutional control**. A re-training fund could operate in the same way. Louie and Pearce (2016) suggest that this could attract quality employees. It is important to view these types of programs in the context of industry profits and the **compensation package for CEOs and top managers; a slight reduction** in these revenue sources could make a significant difference.

If re-training were to be **government-led**, Pearce and Louie (2016) suggests governments could use their **existing educational jurisdiction to push for re-training curricula**. Making available scholarships and grants, subsidizing training workshops, low-interest loans or free courses and certificates could support this process. According to Pearce and Louie (2016), these efforts are best pursued by regional governments, which are usually better placed to implement policies suitable to the local context.

The Institute and Center for American Progress in Brecher (2015) suggests the creation of a "Superfund" that could be drawn upon to provide support for worker and communities most significantly impacted during a transition. Funding would be one-quarter public funds and three-quarters private funds. Regions with **above-average fossil fuel employment would receive some compensatory funding** from the Federal Government to facilitate the transition process.

Principles for a Planned Transition

6. A transition should be supported by a comprehensive climate change policy package.

BMU (2006), Baile *et al.* (2001) and Krause *et al.* (2003) in Fankhauser, Sehlleir and Stern (2008) suggest that more jobs will be created in the long term with a variety of climate change policies in play. **A comprehensive plan** can include market-based mechanisms such as **carbon pricing, emission regulations and energy standards and targeted support for renewable energy developments**. This kind of mix could result in a net creation of 250,000 (Krause *et al.* 2003) to over a million (Baile *et al.* 2001) jobs in two decades in the USA.

Van den Berge (2010) analyzes the successes of the top four countries in clean energy technology (Denmark, Brazil, Germany and Spain) and finds that each shared early and consistent government support and targeted development of home markets for innovation. They recommend that regions looking to emulate this success develop supporting policies such as launching **targeted programs to bring clean energy technology from research into demonstration**, **encouraging financial institutions to integrate climate risk** into their evaluation criteria and developing a strong home market through **consistent government support and clear investment signals**.

Principles for a Planned Transition

7. To minimize costs and maximize benefits, transition planning should begin as soon as possible.

The Alberta Federation of Labour (2017) points to the successes of other transitions in Wisconsin and Washington. They note that ample time to plan, inventory skills and the workforce, and retrain, was key to success in these cases.

References

Alberta Federation of Labour and the Coal Transition Coalition. 2017. "Getting It Right: A Just Transition Strategy for Alberta's Coal Workers."

Apergis, N. and Payne J.E. 2014. " The causal dynamics between renewable energy, real GDP, emissions and oil prices: evidence from OECD countries." Applied Economics 46(36): 4519-4525.

Babiker, M., Eckhaus, R.S., 2006, Unemployment Effects of Climate Policy, Report No. 137, MIT Joint Program on the Science and Policy of Global Change, Cambridge, MA

Brecher, J. 2015. "A U.S Program for Controlling Climate Change and Expanding Job Opportunities: A Review of a Proposal by Robert Pollin, Heidi Garrett-Peltier, James Heintz and Bracken Hendricks." Challenge 58(2): 175-186.

Bridge T. and R. Gilbert. 2017. "Jobs for Tomorrow: Canada's Building Trades and Net Zero Emissions." Eds. Beresford C., Luke H. The Columbia Institute.

Bowen, A. " 'Green' Growth, 'Green' Jobs and Labour Markets." Policy Research Working Paper 5990. The World Bank, Sustainable Development Network.

Fankhauser, A. Sehlleier F., and N. Stern. 2008. "Climate change, innovation and jobs." Policy Analysis. Climate Policy 8: 421-429.

Garforth, P. and D. Medearis (2011), "Green Jobs Strategy and the Transition to the Low-Carbon Economy in Northern Virginia", *OECD Local Economic and Employment Development (LEED) Working Papers*, 2011/07, OECD Publishing, Paris.

Hamilton J. and D. Liming. 2010. "Careers in Wind Energy." Green Jobs: Wind Energy. U.S. Bureau of Labor Statistics.

Jeyakumar, B. 2016. "Job Growth in Clean Energy: Employment in Alberta's emerging renewables and energy efficiency sectors." Ed. Suzy Thompson. Pembina Institute.

Kammen D. M., Kapadia K., and M. Fripp. 2004. "Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?" Report of the Renewable and Appropriate Energy Laboratory. University of California Berkeley.

Kayani, J. 2015. "Challenges in determining the Employment Generated by Climate-Change Policies." The Open Fuels & Energy Science Journal 8:218-223.

Louie, E.P. and J.M. Pearce. 2016. "Re-training investment for U.S. transition from coal to solar photovoltaic employment." Energy Economics 57: 295-302.

McGlade C. and P. Etkins. 2015. "The geographical distribution of fossil fuels unused when limiting global warming to 2 °C." Nature 517: 187-190.

Meagher, G.A., Wilson, R.A. and J.M. Dixon. "Climate Change Mitigation and Employment Growth." Centre of Policy Studies Working Paper No. G-244. Victoria University.

Pollin, R. and B. Callaci. 2016. "A Just Transition for U.S. Fossil Fuel Industry Workers." The American Prospect: 89-93.

Rathzel N. and D. Uzzell. "Trade unions and climate change: the jobs versus environment dilemma." Global Environmental Change 21: 1215-1223.

Saskatchewan Southeast Enterprise Region. 2017. "Regional Overview." http://www.sseer.ca/regional-overview/

Stillwell, F. and A. Pearce. "'Green-Collar' Jobs: Employment Impacts of Climate Change Policies." Review Article. Journal of Australian Political Economy 62: 120-138.

Tvinnereim E. and E. Ivarsflaten. 2016. "Fossil fuels, employment, and support for climate policies." Energy Policy 96: 364-371.

Van den Berge, J. 2010. "Employment opportunities from climate change mitigation policies in the Netherlands." International Journal of Labour Research 2(2): 211-231.

World Bank. 2012. “New Report Examines Risks of 4 Degree Hotter World by End of Century.” Press Release. http://www.worldbank.org/en/news/press-release/2012/11/18/new-report-examines-risks-of-degree-hotter-world-by-end-of-century

Wei M., Patadia S., and D.M. Kammen. 2010. “Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?” Energy Policy 38(2): 919-931.

**Prepared by Hayley Carlson, Policy Coordinator, Saskatchewan Environmental Society, 2017.*