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# Embrace the Possible

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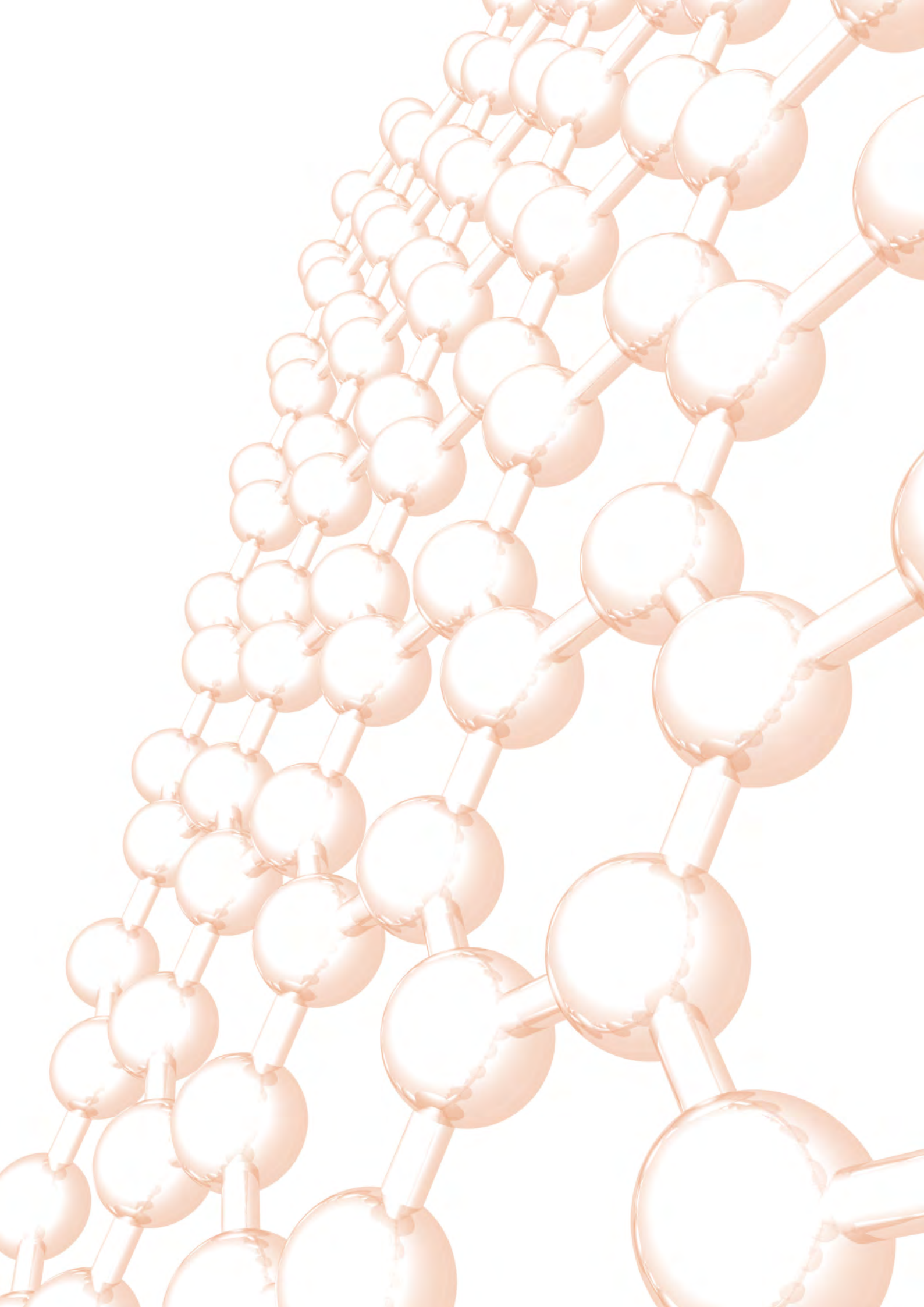
# Embrace the Possible

Ingenuity Lab is a unique organisation. Designed and created to solve many of the grand challenges facing a modern world, Ingenuity Lab is a research organisation that focuses on the development and deployment of effective solutions to seemingly intractable challenges. It works using a formal connect and develop process that involves building teams from members of government, industry, and academia. Central to this process is problem identification and the visualisation of the ideal solution. Often the identified problem is not the problem but a symptom. Symptoms tend to be obvious, but quite often provide little insight into the most effective solution. With the recent intense discussion surrounding the newly imposed Carbon Tax in Canada, I think that it is time to extract ourselves from the emotion of the issue surrounding climate change and examine the impact of humanity on our environment and identify the salient challenges needed to ensure global sustainability.

The unassailable fact is that the earth's climate is changing, but then this has been changing since its creation. The earth's atmosphere, governed by complex, non-linear physical processes is easily perturbed. Changes in solar radiation, volcanic activity, deforestation, construction of cities and roads, large-scale irrigation and yes, the release of CO<sub>2</sub> into the atmosphere can all impact the earth's climate. The challenge is teasing out the climate variations caused by natural phenomena that we cannot manage and the impacts caused by anthropomorphic activities.

Firstly, we need to understand the relative impact of human activity versus natural processes on the climate. Then, we need to isolate the impact of different human activities to further identify the effect that each has on the environment, especially when many of the activities occur simultaneously. For example, the change in albedo, the amount of solar energy absorbed/reflected, caused by the expansion of population centers is usually accompanied by an increase in CO<sub>2</sub> emissions because of the associated increase in human activity. Which of the two impacts are more important? Are their collective impacts additive or multiplicative? Does it matter if the impacts are distributed uniformly over the earth, or are concentrated in small geographic areas? There are many questions yet unanswered. If we cannot clearly define and quantify the "cause" how can we craft an effective solution?

The bottom line is that human activity has impacted the earth's environment since our society has transitioned from hunter-gatherers. In 1798, Thomas Malthus postulated that humans were quickly going to exceed the carrying capacity of the earth and that the positive population checks of starvation, disease, and war were necessary. He also dismissed the idea that technological advances





in agriculture would provide the solution to the earth's resource limits. I hear echo's of Malthus in much of the dialogue surrounding climate change. While no one is proposing eugenic behaviour for addressing man's impact on the environment, there is a distinct tenor in the dialogue that humankind must accept a lower quality of life and reduced opportunity for future generations. There is also the implied truth that the human race cannot address the challenges associated with man's impact on the environment through advances in technology. I soundly reject both premises.

When I was growing up one of my favorite TV shows was Get Smart. I always waited for the moment in the show when Maxwell Smart would use his shoe phone. It was hilarious because most people perceived it as ridiculous. The concept of portable communication, especially at a time when many first responders didn't even have radios, was outlandish. Nine years ago when Apple introduced the iPhone, it revolutionised global communication. In just 30 years the technologies of science fiction fantasy transformed the way we engage in commerce, deliver health care, connect with family and friends, and interact as people. It effectively shrunk the world making the earth a single village where virtually every voice can be heard.

Unfortunately not every voice should be heard at the same volume. The cult of personality has enabled individuals without the requisite gravitas to seed popularism politics and bumper sticker science. By feeding personal prejudices, rational discussion has been kicked to the curb and has been replaced by intensely polarised emotion. Culturally, Canadians have an intense connection to the environment. I believe that it is fair to say that the wonder of nature is strongly woven into the fabric of Canadian society. This is one reason why Canadians feel compelled to lead the charge against global warming and why Canada has acted to impose a significant tax on the use of carbon. The question that many people are asking, both Canadians and non-Canadians, is this an effective path for addressing the global warming challenge?

Canada is currently responsible for releasing approximately 1.6% of all of the global CO<sub>2</sub> emissions. The European Union, China, India, Russia, Japan, and the United States are collectively responsible for releasing over 70% of the global CO<sub>2</sub> emissions. It is doubtful that even a 50% reduction of Canadian CO<sub>2</sub> emissions would have any material impact on global warming. To have any real effect on global warming, CO<sub>2</sub> emission reductions must occur in concert with all 6 of the major emitters. Even with over 10 years of significant effort, it has not been possible to achieve a meaningful coordinated

global response to CO<sub>2</sub> emissions. Acting in isolation will only stress the Canadian economy and place an unnecessary burden on Canadians without achieving the desired goal of reducing man's impact on global warming. There is a better path forward.

We must recognise that humankind has impacted and will continue to impact the earth. It is our responsibility to access the earth's bounty in a sustainable way. Our ultimate goal should be to consume all of the earth's resources within cyclic processes to maximise the utility of all of the resources that we harvest. The economic reusing of resources would ensure their continued availability for future generations. Achieving this vision can only be accomplished through technological innovation.

In examining the challenge of CO<sub>2</sub> emissions you are able to find opportunity. Let's flip our perspective, instead of labeling CO<sub>2</sub> as a waste product we should recognise that it is a valuable raw material. Carbon is the foundation building block of all living organisms. At the very core of the global ecosystem, nature uses the energy of the sun to assemble all living organisms from CO<sub>2</sub>. Visioning the solution to CO<sub>2</sub> atmospheric emissions, we can generically insert our industrial processes within the web of nature's carbon cycle. We take the CO<sub>2</sub> which would normally be emitted into the atmosphere, such as from an electrical power generating plant, and instead, using light, re-purpose the CO<sub>2</sub> into valuable products. Effectively we insert the carbon that would have been wasted and transform it into the fabric of our society. Ingenuity Lab is currently commercialising this new technology.

Using the power of N – take inspiration from nature to guide the manipulation of matter using nanotechnology to build networks, Ingenuity Lab succeeded in replicating the natural process of carbon assembly and translated it into an industrial process. The process required learning how to convert light into the various chemical fuels of life and the ability to cheaply fabricate nano-compartmented systems to assemble an artificial metabolism that fixes and transforms CO<sub>2</sub> into valuable products. While not the total solution to the global climate warming challenge, it does pull back the curtain to display the possible. It shows that the potential for technological achievement is boundless.

We must consider the past technological achievements of modern man as governments assess the optimum strategy for addressing global sustainability challenges. These achievements speak loudly about the human potential for creative innovation. Canada needs to occupy the position as a leading global steward of the environment, but must achieve it as a champion of sustainability through technology. It is the path forward.

Set the stage for a bright future for coming generations by embracing the potential of the possible and understanding that technological achievement can drive market forces that lead to a more sustainable world. World leaders need to focus on providing an environment that supports the crafting of solutions to the global warming challenge and not at regulatory instruments as the primary weapon of choice. This strategy will accelerate economic and societal prosperity and has a much higher likelihood of long-term success. Canada, believe in the inventiveness and creativity of your citizenry. Provide the needed environment, and the people will deliver. The future belongs to the bold.

# Clear trajectory for Canada's clean energy strategy

**By accelerating the transition to renewables, Canada's clean energy strategy is charting a clear course, as Natural Resources Minister Jim Carr sets out here**

**W**hen most people think of Canada's energy resources, they are likely to think about our vast stores of oil and gas. What they might not realise is that Canada is increasingly focused on developing our renewable energy resources as well.

As the world undergoes a historic transition to cleaner forms of energy, countries are positioning themselves to capitalise in a clean growth century. They're realising that climate action is now a competitive advantage. The environment and the economy are now two complementary elements of a single engine of innovation.

Canada's strategy is to leverage the fossil fuel resources we have today to deliver clean-energy solutions for tomorrow. This means making significant new investments in clean energy technology, accelerating its adoption at home and exporting it abroad.

We already have one of the cleanest electricity mixes in the world. Approximately 80% of our electricity comes from non-greenhouse gas emitting sources, primarily hydro (59%) but also nuclear, solar, wind energy, and biomass.

## **A first for solar heating**

Recently, we announced plans to accelerate the phase out of coal-fired power from our electricity mix, which will significantly improve the air quality and the health of Canadians. This initiative will move Canada closer to 90% from non-emitting sources by 2030.

Canadians have already seen exciting developments in clean energy. Last winter, for instance, a community just south of Calgary – the Drake Landing Solar Community – became the first community in the world to meet its heating requirements entirely through solar energy.

Our government is working to accelerate the transition to renewable energy by investing in the research and development of innovative clean energy technologies, energy efficiency programs, alternative transportation infrastructure, and electricity infrastructure interties that promote electricity cooperation across our vast nation.

## **Smart grid technologies**

Since 2001, our renewable energy programs have supported almost 5.4 gigawatts (GW) of new renewable electricity capacity and reduced greenhouse gas emissions in the electricity sector.

Our investments will support the development of clean technologies to increase the supply of renewable energy from sources such as solar and wind energy, as well as that of new and emerging sources, including wave, in-stream tidal, geothermal and biomass. Further, the use of smart grid technologies and grid connections will provide off-grid communities, such as those in the north, with cleaner energy.

Based on existing federal, provincial and territorial policies and initiatives, the International Energy Agency estimates that Canada's renewable capacity is expected to grow by around 13 GW over



*Jim Carr, Minister of Natural Resources*

2015-2021, led by wind energy (7 GW) and solar (2.7 GW). An additional 2.4 GW of hydroelectric capacity could also come on line by 2021.

### **Progress on Canada's clean energy strategy**

We are proud of the progress we've made, but there's still much more to do. Climate change is among the great challenges of our time, and we must make investments that reflect this reality. That's why we're investing an unprecedented \$180 billion in infrastructure. This includes green infrastructure investments of \$5 billion announced in the Budget 2016 and a commitment to provide an additional \$21.9 billion over the next decade. These investments will help support greenhouse gas emission reductions; enable climate change adaptation and resilience; and, help communities have clean air and safe water.

We're investing in new low-carbon and renewable power projects; expanding smart grids to make more efficient use of existing power supplies; and, deploying infrastructure for alternative trans-

portation fuels, including re-charging/re-fuelling stations for electric and alternative fuelled vehicles. In order to meet our emissions reduction target and grow the economy, we have also adopted the Pan-Canadian Framework for Clean Growth and Climate Change – a plan which includes a pan-Canadian approach to pricing carbon pollution, and measures to achieve reductions across all sectors of the economy.

While the transition to a lower-carbon economy may be long, its trajectory is clear. Canada is determined to seize the opportunities presented by the new clean energy economy by acting decisively and investing wisely, and creating jobs and opportunities for generations to come.

**Jim Carr**  
**Minister of Natural Resources**

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