

A New Energy Vision for Canada

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The world presently stands on the brink of a new-energy revolution as significant to this young century as the discovery of petroleum was to the last.



Leading economies are racing toward a bold new vision of a future in which, by about 2050, hydrocarbons have been supplanted by clean and plentiful alternatives. This new era holds the promise of unprecedented prosperity, abundance, and geopolitical stability. Companies will be building value not on what they extract from the earth and process, but on how creatively they innovate a range of energy systems, technologies, and services, in ways that improve environmental quality and human quality of life. **In this future, cities will have transformed themselves for livability and efficiency,** while nations will have stopped going to war to secure the energy they need.

This vision is not an idealistic dream nor an abstract debate, but an entirely practical scenario that is already unfolding. The process of getting from here to there—we are calling it the new-energy transition—is underway and rife with opportunities. Indeed, it represents an unprecedented opportunity for Canada to create wealth, build GDP, bolster the nation’s international credibility, and improve quality of life. This country has a leading role to play in this transition—it has strong research capacity, a national character able to support deep change, abundant renewable electricity and biomass resources, and, critically, the petroleum reserves to finance the shift.

This document imagines a Canada that has fully embraced the opportunities of a new-energy future. Like other discussion papers presently circulating the country, it endorses the idea of a national energy strategy to guide the transition, and recognizes the contributions that Canada’s oil and gas industry make to the economy. Unlike others, this document explicitly links prosperity with deep greenhouse-gas reductions. It also recommends Canada embrace the global new-energy transition away from hydrocarbons and toward an energy services model based on renewable sources. This document also proposes essential ingredients of a national energy strategy, including a price on carbon, sectoral and regional diversity, and indicators to monitor progress toward our goals. The authors and supporters of this document seek to maximize economic prosperity while

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meeting international commitments with respect to carbon, renewable energy, and the phasing out of fossil-fuel subsidies. Any credible plan to transform **Canada’s economy must be rooted in objective information informed by the best science, research, and economic modeling.** We recognize, however, that people approach the energy conversation from different perspectives and assumptions, often based on competing information and analysis. To this end, we propose using normative scenario analysis to inform the development and implementation of a national energy strategy. The technique enables participants to assess different options and alternatives in a collaborative manner, and can help provide decision makers with more objective information. Scenario planning identifies various frames and respects the differences between them, rather than pushing them to one side. We also propose some initial broad design parameters for a process to develop a national energy strategy.

In March, we shared this vision and proposed approach to a national energy strategy with well over 100 leaders from multiple sectors, from coast to coast to coast. We have incorporated much of their feedback into this document, including a strong endorsement that deep greenhouse-gas reductions must be included in any proposed new energy policy framework for Canada.

This new era holds the promise of unprecedented prosperity, abundance, and geopolitical stability.



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INTRO

1.0 DARE TO DREAM BIG

Come
crunch time,
Canadians
have a proven
ability to pull
together and
get the job
done.

First came the arms race. Then, the space race. Now, the nations of the world are in the throes of a different competition—the new-energy race—and the stakes are no less dramatic. The winners will effectively lead their economies into an era of unprecedented prosperity, security, and abundance—with strong employment, strengthened ecosystems, lowered public-health costs, and improved quality of life, among other benefits.

The United States, China, Great Britain, and many other nations are working today to rapidly transition off hydrocarbons and reorganize their cities and societies to provide energy services in ways that are environmentally and socially benign. These countries are making big investments, training the brightest, hiring the best, incubating new technologies, and moving rapidly into a future that will look very different than the present. All are pursuing an immense opportunity. The International Energy Agency is calling for global renewable-energy investments of \$430 billion by 2020 and \$1.2 trillion by 2030.

Where is Canada situated in this global race? With outstanding universities, a proud history of innovation, and a wealth of natural resources, we have assets that position us well as leaders, and a stable financial system to manage the transition. Ernst & Young cited this latter quality last year, when the firm ranked Canada 9th out of 27 economies for renewable-energy investment attractiveness.

We also have the hydrocarbons necessary to support us through this shift, tremendous efficiency potential, technologies needed to provide energy services with much less input energy, myriad sources of clean energy, and the research capacity to create the innovations that will ultimately become some of our leading export products. Further, we have a favorable national character to embrace transformation; we are one of the few jurisdictions in the world with a demonstrated ability to find common ground on complex challenges. Come crunch time, Canadians have a proven ability pull together and get the job done.

However, while Canada has an enviable opportunity to thrive in this new energy era, we have some catching up to do. We must activate our considerable potential to achieve this opportunity. The world is moving quickly, and we risk being left behind. We can no longer afford to stand on the sidelines.

In January, President Obama instructed his nation's scientists and engineers to focus on the most difficult clean energy problems, and assured them his government would fund what he called "the Apollo projects of our age." A new U.S. Department of Energy program called SunShot is working to bring the price of solar photovoltaics down to \$1 per watt—competitive with natural gas—within six years. Meanwhile, Shanghai recently minted the world's first wind-energy billionaires. In 2009, Chinese investments in new energy topped \$34.6 billion, almost double those of the United States.

For its part, Canada has invested little in new energy. Others are looking to wind, solar, enhanced geothermal and more, but we haven't yet meaningfully embraced these energy solutions of the future. Before we can join this vanguard and occupy a position of leadership on the world energy stage, we must fully embrace the possibilities of a post-petroleum era. We must identify our strengths, dare to dream big, then roll up our sleeves and get started.

For much of the past year we have been working to assess the Canadian energy landscape, with the goal of identifying potential components and policies of a new-energy vision. We have drafted and revised the enclosed vision with the input of more than 100 leaders from business, academia, non-government, local government, and aboriginal organizations organizations, from coast to coast to coast. The result is an inspiring snapshot of a future Canada that has largely moved on from fossil fuels. We hope the document will serve as a catalyst for conversations between Canadians and their leaders about the best path forward to this future.

To this end, we have also identified a few of the key elements of the pathway needed to realize the vision. As a first step, we propose a collaborative engagement process that would develop a national energy vision, framework, strategy, or accord. We do not underestimate the complexity of this task, but we do know that Canadians will not embrace such an agreement or set of agreements without first engaging in deep and meaningful conversations on the issues, opportunities, and tradeoffs. Such a process requires extensive consultation—not only among thought leaders and elites—but among all Canadians, including aboriginal people. We are committed to such an approach, and will be willing contributors to the hard work that lies ahead.

PHOTO JAMES GLAVE

INTRO

1.1 PURPOSE OF THIS DOCUMENT

We must
identify our
strengths,
dare to dream
big, then roll
up our sleeves
and get
started.



2 OUR CHALLENGE

As leading economies work to reduce their reliance on imported petroleum, Canada's deepening commitment to hydrocarbons could leave our economy vulnerable and exposed in the coming decades. Spurred by a range of factors (see "The Five Drivers of Change," page 13) our nation's two largest export markets—the United States and China—are competing to develop energy services and solutions based on clean and abundant sources that will never run out.

Canada is doing little to join this race and take advantage of the many opportunities presented by the new-energy transition. Instead, our economic strategy appears to be rooted in an assumption of ever-increasing global demand for our petroleum products. In this respect, we are concerned that we may be sacrificing Canada's long term stability for short term gain. When everyone else has moved ahead in the new-energy transition, we may well find ourselves scrambling to assemble the necessary talent, incubators, and research facilities to compete on the world stage and uphold our reputation as responsible global citizens. If we settle for an approach, strategy, or suite of policies that does not drive deep change with the appropriate scope, scale, and speed—we will leave our nation vulnerable to forces beyond our control, and ultimately endanger Canada's economic future.



OUR CHALLENGE

We may find ourselves scrambling to assemble the necessary talent, incubators, and research facilities.

PHOTO COURTESY LIGNOL INNOVATIONS

OUR CHALLENGE

2.1 A CALL FOR ACTION

The transition will take time and will likely prove one of the most difficult tasks we have ever tackled as a nation.

In Canada, energy resource development is presently a strong economic driver. Hydrocarbon export revenues contribute to GDP and help fund public services such as healthcare and education. But profound change is coming, and we must be ready for it. We must prepare for a day when we fund these critical public services with alternative revenue sources.

Canadians already sense this to be the case. A recent Decima Research poll produced for Natural Resources Canada found that a majority of citizens believe the energy sector is one of the most important parts of Canada's economy, and that the federal government should lead the way in finding alternatives to oil.²

"There is not an expectation that Canada should transition overnight, but rather start the process of moving toward more environmentally friendly (but still reasonably cost-effective and reliable) sources in the medium term, and then further up the environmental continuum in a longer term future," the report's summary states. "[Canadians] believe that this may not happen without some form of leadership, with objectives and time frames in place for this transitional process, and ideally, investments made in facilitating this transition."

Indeed, the transition will take time. Reinventing our approach to something so core to our lives and economy will likely prove one of the most difficult tasks we have ever tackled as a nation—similar in ambition to building the transcontinental railway. But like that project, this one must be undertaken if we are to remain strong as a nation and competitive in tomorrow's marketplace of resources and ideas. The longer we wait, the more it will cost us.

Canadians are some of the highest per-capita energy users in the world. In a recent OECD survey of 31 economies, using total primary energy supply per capita—which accounts for climate and distance factors—Canada ranks as the third least-efficient country, slightly less efficient than the United States.³ Cold countries such as Sweden and Finland use a fraction of the energy that Canada does.⁴ While discouraging on its surface, the statistic points to the tremendous opportunities to be found on the demand side of the spectrum. Conservation opportunities are largely driven by behavioral and social factors, while efficiency wins are largely an outcome of how we design and manage our appliances, cars, homes, neighborhoods, and entire cities.

Opportunities in the efficiency sector include technical solutions such as efficient building-envelope materials and software solutions that continually audit buildings for energy anomalies. Others exist in professional services such as planning, architecture, and design, and the skilled trades needed to retrofit, redesign and rebuild our homes and communities to make them more complete, compact, and livable. If we drastically reduce our overall need for energy through design improvements, compact, transit-oriented communities, and innovations in building materials, we build-in resilience to future energy price increases.

When it comes to building-envelope design, Canadians have a reputation as pioneers. In 1977, Canadian ingenuity built the Saskatchewan Conservation House—a prototype home that required only a bare minimum amount of energy for heating and cooling. Eventually, the design informed the development, in Austria, of the Passivhaus performance standard. We can lead in this innovation again.

SCREENSHOT COURTESY PULSE ENERGY. PHOTO © ISTOCKPHOTO.COM/DEEPBLUE4YOU.

OUR CHALLENGE

2.1.1 DEMAND -SIDE OPPORTUNITIES: EFFICIENCY AND CONSERVATION



OUR CHALLENGE

2.1.2 SUPPLY-SIDE OPPORTUNITIES: RENEWABLES AND ENERGY SERVICES

Economists often speak about “demand for oil.” But the truth is, there is no demand for oil.

One of the more subtle, but critical, characteristics of the new energy era is that it requires a philosophical shift from thinking of energy not as a product, but as an enabler of services.

Consider transportation. Economists often speak about “demand for oil.” But the truth is, there is no demand for oil. Instead, there is an appetite for the energy service of safe, affordable, and reliable mobility, or whatever other service oil consumption currently provides. Despite the headlines, China doesn’t have a growing thirst for petroleum; it has an increasing need for the energy service of transportation, and is presently making unparalleled new energy investments to address it. It is increasingly plausible that China’s solution to meeting the demand for personal mobility will not require imported oil.

There are numerous ways to meet the demands for energy services from renewable sources. The nations that invest today to find new ways to fulfill these demands tomorrow via clean, abundant, and non-polluting sources will dominate the global new-energy economy.



OUR CHALLENGE

2.1.3 THE FIVE DRIVERS OF CHANGE

The vision offered in this paper presents exciting new opportunities for innovation, global cooperation, and trade. Each year, investors pour some \$120 billion into renewable energy⁵ representing a total market value of more than \$1 trillion.⁶ A recent HSBC assessment of stimulus packages notes that global governments invested \$430 billion in climate-change related infrastructure projects in recent years.⁷ (See Table 1 for a country-by-country comparison.) But while these benefits entice us to join this new race to the future, there are also drivers in the form of larger shifts, trends, and pressures that we can no longer afford to ignore.⁸ **We have identified five of these drivers:**

1. Increasing demand for energy services as world population grows, while petroleum and other non-renewable energy sources become increasingly challenging, risky, and costly to find, extract, and transport;
2. The growing global interest in energy independence and security, including the desire to become less reliant on foreign sources of energy;
3. The pressure to reduce the risks and impacts of fossil fuel extraction, distribution, and consumption, particularly with respect to greenhouse gases and climate disruption;
4. The imperative to maintain Canadian competitiveness in the coming decades as other major economies increasingly shift to non-hydrocarbon energy sources; and
5. The increasing demand from the world’s most vulnerable populations to address energy poverty and inequity, while simultaneously minimizing the risk of climate-change impacts on those same peoples.

Whether it suits Canada’s present business interests or not, these drivers are inexorably pushing us to an energy future that will be markedly different from the one we have today.

PHOTO COURTESY BERNIE STELZER.


When the Experts Tell Us It Can’t Be Done
Many with a big stake in the status quo may call *A New Energy Vision for Canada* unrealistic. A number of current reports and frameworks authored by these interests typically characterize the coming transition as “gradual,” and position aggressive timeframes as plainly impractical. It is valuable to remind ourselves just how wrong experts that are the most invested in a given paradigm can actually be.

“With over fifteen types of foreign cars already on sale here, the Japanese auto industry isn’t likely to carve out a big share of the market for itself.” —*Business Week*, August 2, 1968.
“There is no reason anyone would want a computer in their home.” —Ken Olson, president, chairman and founder of Digital Equipment Corp. (DEC), maker of mainframe computers, arguing against the personal computer in 1977.

“There is practically no chance communications space satellites will be used to provide better telephone, telegraph, television, or radio service inside the United States.” —T.A.M. Craven, U.S. Federal Communications Commissioner, in 1961.
“Television won’t last, because people will soon get tired of staring at a plywood box every night.” —Darryl Zanuck, movie producer, 20th Century Fox, 1946.

TABLE 1: Green Stimulus Investment

Jurisdiction	2009 Investment
China	\$221 billion
United States	\$112 billion
South Korea	\$31 billion
European Union	\$23 billion
Germany	\$14 billion
Japan	\$12 billion
France	\$7 billion
Canada	\$3 billion
Australia	\$2 billion
United Kingdom	\$2 billion
Source: HSBC	

A woman wearing a white hard hat and a teal shirt is smiling and looking towards the left. In the background, a wind turbine is visible against a clear blue sky. The overall scene is bright and positive, suggesting a focus on renewable energy.

A NEW ENERGY VISION FOR CANADA

What might the new-energy transition look like on the ground?

To follow, we outline several of the key components of a proposed energy vision for Canada in 2050.

The picture we begin to paint here sounds ambitious—and it is. Some may scoff and dismiss it outright. And yet almost everything we describe already exists somewhere in the world, in one form or another.

Our challenge will be to select the best of these examples and models, and adapt them to our unique circumstances and needs.

NEW HOMES



New Models of Home and Neighborhood

By 2050, the average Canadian home could become a net producer of renewable energy. Once retrofitted for performance and connected to a sophisticated and reliable grid, homes could be providing energy for comfort, illumination, entertainment, and other needs. They could also provide their owners with a measure of security against energy price increases, because the renewable “fuel” to heat, cool and power such a home would be free. In our vision, Canadian homes would be at once beautiful, accessible to a wide range of ages and lifestyles, and straightforward to operate and maintain.

Canada’s cities and towns could become integrated energy systems that enjoy remarkable efficiencies by considering together the needs and opportunities of services such as water and resource recovery with those of buildings and transportation. Unobtrusive and non-polluting district heat and power plants could provide resilience and a sense of community ownership over energy. In the neighborhoods of 2050, we envision all the pieces of urban infrastructure working together, dynamically and seamlessly sharing resources and information for maximum efficiency. (See “Inside Tomorrow’s Integrated City,” page 19)



PHOTOS FROM TOP: ©ISTOCKPHOTO.COM/TROUT55; COURTESY NEXTERRA GREEN HOMES, WWW.NEXTERRA.COM; COURTESY URBAN ADVANTAGE.

IN THE CITIES OF 2050 WE ENVISION ALL THE PIECES WORKING TOGETHER

NEW TRANSPORT

Efficient Modes of Transportation

A business trip between Toronto and Quebec City could take just under two-and-a-half hours, from office to office, aboard a comfortable, reliable, and Canadian-built high-speed train. We expect virtually all passenger cars would be powered by electricity generated from renewable sources, while buses might be powered by hydrogen fuel cells or other alternative low carbon sources of energy. Clean, efficient, and reliable public transportation, such as streetcars, could connect neighborhoods with schools, shops, and services.

As a trading nation, we could also realize significant opportunities in freight. We might move far more of our shipments via efficient rail and marine modes, while trucks might be powered with liquid renewable biofuels. In urban areas, fleets of electric delivery vehicles might help move commercial goods to market. Aviation will likely remain one of the last sectors to transition off fossil fuels.

CONNECTED, RENEWABLE, RELIABLE



PHOTOS FROM TOP: COURTESY ZENN MOTOR COMPANY; ©ISTOCKPHOTO.COM/NUNO.

SMALL FOOTPRINT, BIG IMPACT

Leadership in Renewables and Energy Services

In the new energy economy of 2050, we envision that Canada will overwhelmingly derive its energy from clean and renewable sources—wind, solar, water, biomass, and geothermal resources—instead of fossil fuels. Our industrial sector will remain vibrant while significantly different from that of 2011. When Canadians extract resources from their land and water base, they might do so with the smallest possible impacts and maximum possible value. Canadians could be key players in the closed loop of recovery and re-use of materials such as aluminum, steel, and asphalt. The nation’s commercial infrastructure might itself be part of the integrated energy system, and produce its own heat, electricity, and mobility.

We expect petroleum companies will, by 2050, have transformed into predominantly renewable energy and energy-services companies. They will no longer be selling energy commodities, but will instead deliver a wide range of energy services to Canadians.

NEW LEADERSHIP

CANADIANS COULD BE GLOBAL LEADERS IN ENERGY SERVICES

NEW PROSPERITY

Economic Prosperity

In 2050, Canada could be enjoying a vibrant, diverse economy and an international reputation as a developer of energy production and conservation technologies, innovative transportation products, and other value-added innovations. Our economy would produce a much higher rate of GDP per unit of energy consumed, drastically improving our energy productivity. Rather than bulk exporters of hydrocarbons, Canadians could be global leaders in the design, engineering, and manufacturing of sophisticated energy services. This prosperity could be the direct outcome of a joint industry-government innovation fund that might set aside a portion of oil and gas revenues. Such a fund could establish leading-edge research facilities and support job training programs across the country.



Changing Attitudes Starts with the Citizen

By the middle of this century, we expect Canadians will have completely transformed their relationship with energy. In our vision, they would no longer assume that energy is free and ubiquitous, nor take the services it provides for granted. Instead, they would prioritize conservation and efficiency above all other considerations when making a decision in the home or marketplace. When Canadians do require power and heat for buildings, transportation, communication, entertainment, and so on, we envision they would be generating it from renewable sources. They might also be producing this heat and power closer to where they use it, and use it sparingly—not because they would somehow be compelled to sacrifice their lifestyles, but because they would simply need less energy to conduct the business of daily life. They would quite literally be doing more, with far less.

Similar to this country's success in largely eliminating illiteracy, by 2050 Canadians could become very knowledgeable about the close connections between our energy system, economy, and ecosystems. We imagine they might cultivate a strong sense of stewardship and pride of ownership over their energy services.

NEW ATTITUDES

ENERGY + ECONOMY + ECOSYSTEMS

PHOTO: ©ISTOCKPHOTO.COM/SHARPLY_DONE.



OUR SENSE OF SELF, REVISITED NEW IDENTITY

PHOTOS FROM TOP: ©ISTOCKPHOTO.COM/MTROMMER; COUTESY BERNIE STELZER.

Changing National Identity

As a country that built its wealth and power on the back of its substantial natural resources, Canadians have long seen themselves as hewers of wood and drawers of water. But our leadership in sectors such as telecommunications and transportation point the way to a different kind of national identity—one based less on extraction and more on the potential of adding value and delivering a range of energy services innovations to domestic and export markets. While we will still be exporting raw materials for decades to come, we could also be offering the world an increasingly sophisticated and diversified portfolio of energy innovations.

Inside Tomorrow's Integrated City

The new energy transition will unfold first in Canada's cities. That's because major population centers bring people together in dense, livable communities that can support sustainable transportation, micro electricity grids, district energy systems, and other innovations to deliver low-carbon energy services.

Canadian local governments are already turning to a range of bylaws, regulations, and financial instruments to do so, and are saving residents money while improving health and quality of life. But work now underway through Quality Urban Energy Systems of Tomorrow (QUEST) and the University of British Columbia—among other institutions—suggests that truly deep emissions cuts

can be realized when a given community considers all of its energy and electricity needs together as a single system, managed by an intelligent network.

Enter the "integrated community energy system"—a way of planning and administering neighborhoods to consider all the energy needs and opportunities of electricity, heating and cooling, and perhaps even mobility, with other traditional municipal services such as water and wastewater. Though the barriers to this approach are not trivial, we believe it will not only position our population centers for prosperity, but also offer myriad opportunities for Canadian private sector innovation and export.



OUR CHALLENGE

2.2 THE RISKS OF BUSINESS AS USUAL

China, for example, recently committed to place one million electric cars on the road per year.

As the world's large economies jockey for position in the race to a new-energy future, Canada is languishing near the back of the pack. By one account, this nation has in recent years missed out on approximately 66,000 jobs because the federal government has failed to match the United States in clean-energy investments.⁹

But while Canada is overlooking employment opportunities today, these losses are minor compared to the risk of serious economic disruption in the coming decades. A number of presently circulating Canadian energy-policy frameworks appear to assume an ever-increasing domestic and international demand for our raw carbon based energy commodities—particularly in rapidly developing and urbanizing nations of the Pacific Rim.¹⁰

However, the recent dramatic surge in low-carbon infrastructure investments in these nations—particularly in the transportation sector—point to an increasing push to sharply reduce dependence on imported oil. China, for example, recently committed to place one million electric cars on the road per year. By 2020, that nation's high-speed rail network is expected to connect all provincial capitals and cities with populations over a half-million, significantly offsetting domestic aviation and the petroleum it requires.

While China and other markets will, in the short term, increase their demand for oil, real risk exists that these economies will eventually leapfrog over 20th-century energy sources, and take advantage of the inevitable mass commercialization of more nimble, scaleable, and sustainable innovations brought to the global market by nations that are investing today in cleantech research and development. By 2030 or so, we expect many nations will have reinvented their economies and retrofitted their cities to become more complete, compact, and liveable. These cities will use dramatically less energy in general, and far fewer hydrocarbons in particular.

Several recent assessments suggest that potential exists for a very different global energy system by the middle of this century.¹¹ One recent study, conducted by Stanford University and the University of California, concludes that the world can meet all of its new-energy needs with wind, water, and solar by 2030, and can replace all pre-existing energy sources with these renewable sources by 2050.¹²

We are concerned that, if Canada continues to place petroleum at the center of its energy-planning future, that a rapid global shift away from hydrocarbons could ultimately jeopardize our long term economic stability, public services, and quality of life. Further, any economy that grows too dependent on any one commodity or sector stands to undermine other sectors. Canada has already lost manufacturing jobs as a consequence of our currency's close link to the price of oil.¹³

Beyond these economic vulnerabilities, there are numerous security, stability, and reputational risks associated with Canada's current path of increasing fossil-fuel reliance.

Though Canada generates much of its electricity through hydropower, for the most part this nation meets its energy needs through fossil fuels, and helps other economies do the same. About 80 percent of our greenhouse-gas emissions are a direct consequence of the hydrocarbons we burn to make electricity, heat our buildings, power our transportation, and extract, upgrade, and refine petroleum.¹⁴ Canada is the world's 9th largest overall carbon emitter, 8th most polluting on a per-capita basis, and 10th with respect to total cumulative emissions.¹⁵

PHOTO COURTESY WWW.IRRI.ORG.UK.

While some argue that our greenhouse-gas emissions are relatively low compared to those of other countries, the fact is, every nation must do its fair share. Our nation's contribution to climate disruption more than doubled between 1990 and 2008—increasing by 121 percent. One of the largest areas of growth is in the fossil-fuel sector, including Alberta's oil-sands projects. According to Environment Canada data, emissions from these operations have tripled since 1990. If all oil sands projects that are currently seeking approval or have been announced by companies proceed, production will more than quadruple today's levels.¹⁶ Without widespread and aggressive deployment of carbon-capture and storage technology, which, despite significant federal subsidies, remains in its infancy, emissions will follow on a similar scale.

As a northern nation, Canada is already witnessing the impacts of climate change in the Arctic. Our northern residents are particularly vulnerable, especially indigenous peoples who have done little to contribute to the problem but who are now observing massive changes in weather, ice formation and movement, game migration, and more. These residents are also grappling with the opportunities and risks inherent in increased marine traffic through an ice-free northwest passage, including the possibility of increased petroleum exploration.

As detailed in Section 3.1.2 of this document, Canada has made a range of international commitments to reduce its own emissions and limit average surface temperature warming to 2° above the pre-industrial era. To date, our governments have done little to meet these commitments. Despite well-documented economic benefits, this country is investing relatively little in new energy technologies, and is not committing significant resources to helping Canadians shape their future and understand the role of energy in their lives, and the many benefits of conservation and efficiency.

OUR CHALLENGE

2.2 THE RISKS OF BUSINESS AS USUAL



Communities Lead the Way

A number of local governments around the world have shown that, with the right mix of policies and the support of residents, it is possible to grow economies while reducing greenhouse gas emissions. Here are just three of many examples from around the world.

Since the early 1990s, Güssing, Austria—a town of 3,800 near the border with Hungary—has reduced its greenhouse-gas emissions by 90 percent while creating hundreds of new jobs. A visionary local council set the tone early on by committing to replace fossil fuels with renewable sources of energy, and did so largely through combined heat-and-power plants powered by locally grown biomass. The town is now a regional hub of biogasification research.

In the late 1990s, the town of Övertorneå, Sweden, grappled with high unemployment and had lost 20 per cent of its population during the preceding decades. Town planners created a shared vision of a local economy based on renewable energy, public transportation, organic agriculture, and rural land preservation. In 2001, the community declared itself fossil-fuel free. The region is now the largest organic farming area in Sweden and more than 200 new businesses have sprung up.

In the span of a decade, Samsø, Denmark, transformed itself from a coal- and petroleum-dependent island community of 4,300 to one entirely run on renewable energy. Without any direct subsidy from the Danish government, the islanders built a CAD\$70M wind, solar, and biomass community energy system. Local investors raised 80 percent of the capital.

OUR CHALLENGE

2.3 BENEFITS OF A NEW ENERGY ECONOMY



The transition also presents new possibilities for partnerships with First Nations, Inuit, Métis, and other aboriginal groups.

Although profound change is daunting, Canadians have made such dramatic adjustments before¹⁷ and the potential rewards are great. The transition to a new-energy future promises benefits for a generous cross-section of Canadian society. Researchers, engineers, and financial sector professionals will follow the flow of new-energy investment, building up Canada's own brain trust while attracting the best and brightest from beyond our borders. The transition also presents new possibilities for partnerships with First Nations, Inuit, Métis, and other aboriginal groups. Meanwhile, the transition will enable the training, retraining, and advancement of many thousands of Canada's trades workers.

Our success will leverage Canada's innovative spirit, collaborative values, and our global diversity in culture and experience. It will also build upon our northern climate—our agricultural exports may become critical to help feed a warming world—and our vast reserves of renewable biomass. We expect myriad other benefits will flow from this transition, including:

Socio-Economic Benefits

The drive to redesign, retrofit, and rebuild Canada's cities and towns will create new jobs in design and planning, construction trades, building-material manufacturing and reclamation. The shift to decentralized and community-based energy systems will also generate local employment to manage and maintain those systems. Local stewardship of integrated energy systems will enhance a sense of overall community in how Canadians work, play, learn, and care for our children and elders. We will eliminate energy poverty, particularly in aboriginal communities, many of which presently rely on polluting and expensive diesel generators. No longer will a million Canadians have to choose each month whether to pay for their rent or their utilities. Through a national energy strategy, Canada will identify its competencies and niche strengths in energy-services innovation. We will become global traders of energy solutions, rather than raw materials.

Ecosystem Benefits

We can live within our means while safeguarding our air, lands, and oceans, and the services they provide. By embracing a new-energy future, we will eliminate our contribution to the buildup of heavy metals, fossil fuels, and toxics in our ecosystems, while dramatically reducing and eventually eliminating our contributions to climate change. In this new energy vision, we do not need to seek a "balance" between the environment and the economy; we strengthen both at the same time.

Personal Benefits

We will retrofit and densify our communities to lessen our dependence on motor vehicles and encourage walkability and other active-transportation modes, triggering multiple physical health and personal wellness benefits. A considerable body of research details the present public health costs of airborne particulates and smog on our communities. In a new energy vision of steadily decreasing fossil fuel combustion, the incidence of such respiratory-related illnesses—the result of gasoline- and diesel-based transportation—will be dramatically reduced. This will offer myriad health benefits to Canadians and a corresponding reduced burden on public health care. Canadians would see a dramatically improved quality of life, and have more money to spend on things other than energy.

Reputational Benefits

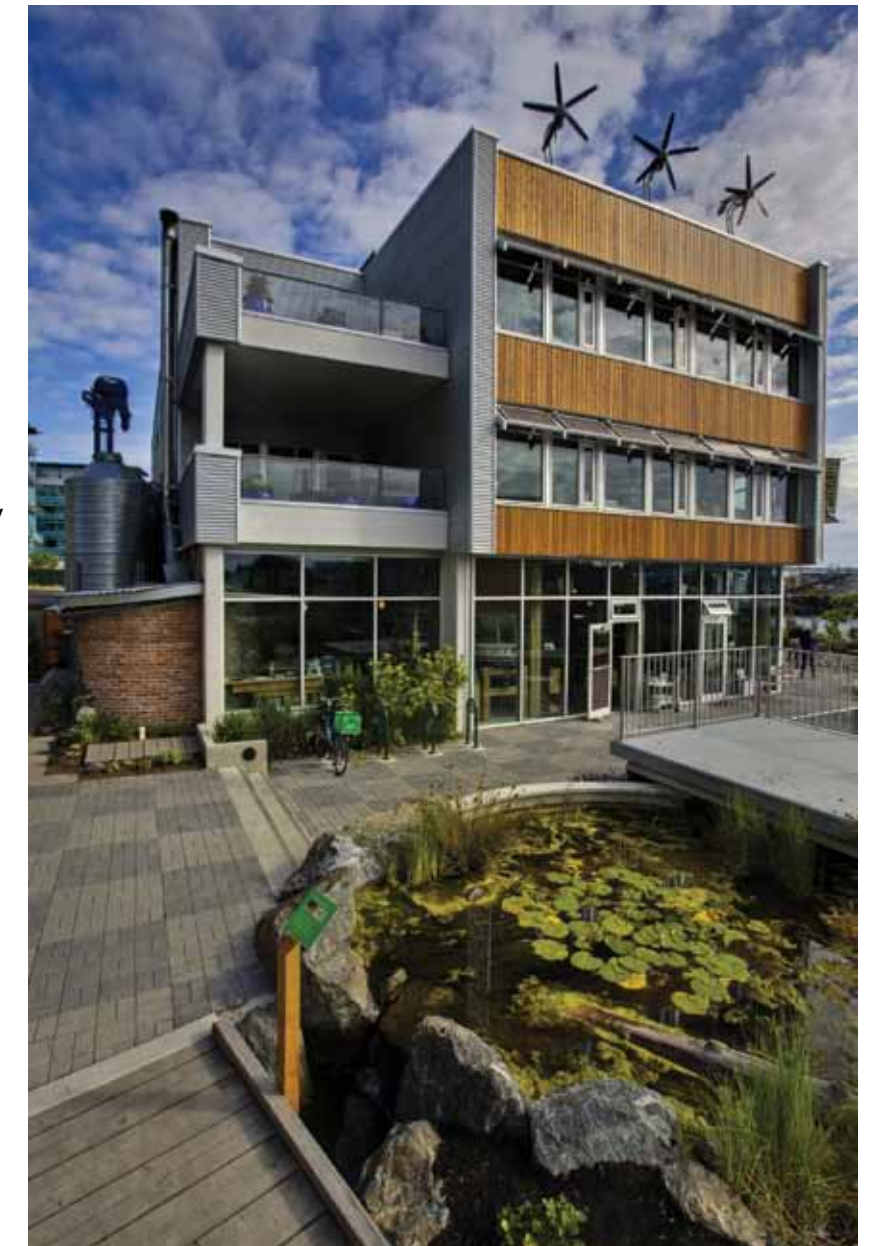
Good things come to those who lead. As our investments begin to pay dividends—as we offer the global community Canadian-made and designed new energy innovations—this country will strengthen its reputation on the world stage as a leader and innovator. As international standing and respect flourish, multiple benefits and opportunities will flow our way, including further investments and potential new-energy trade alliances.

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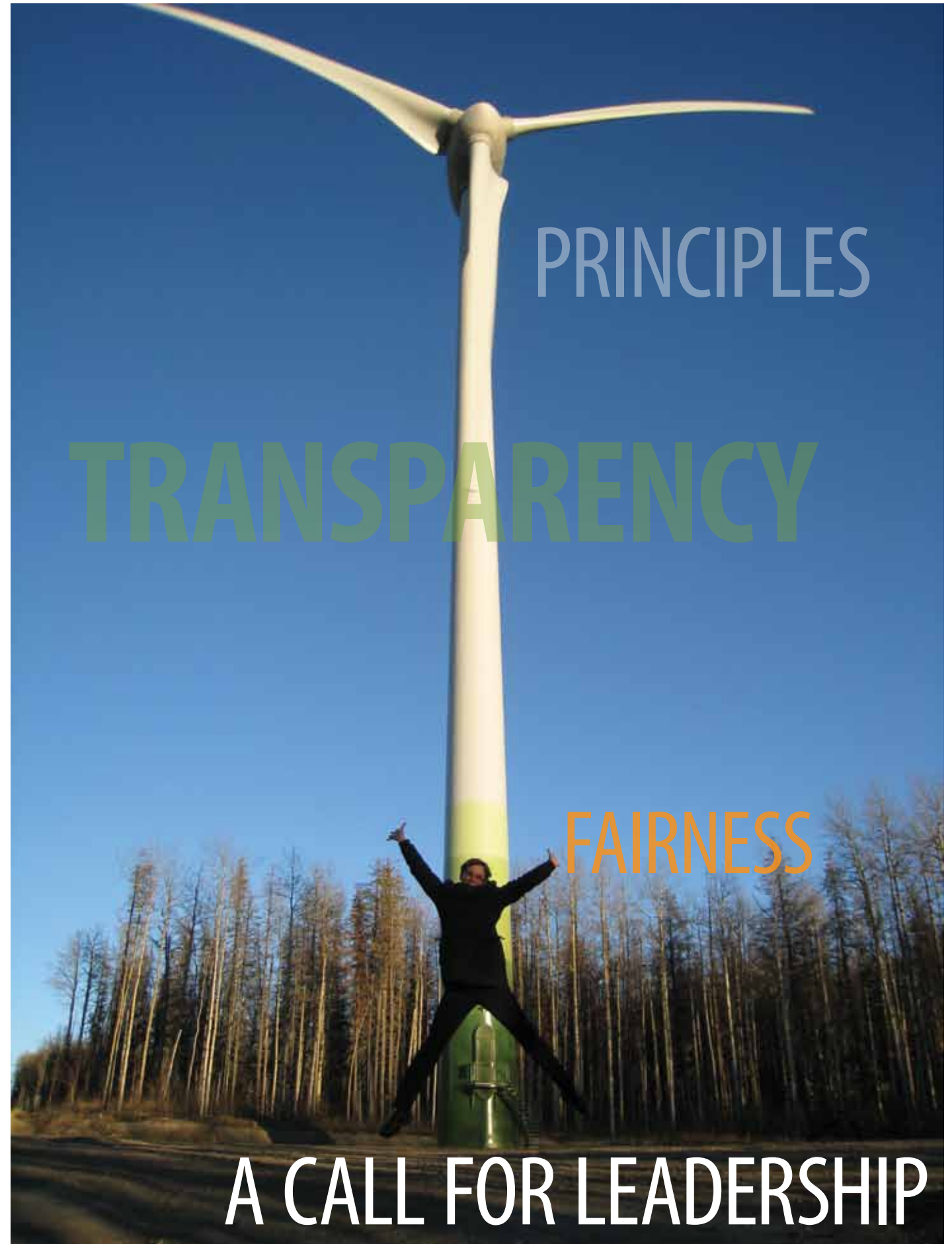
We do not need to seek a "balance" between the environment and the economy; we strengthen both at the same time.

OUR CHALLENGE

2.3 BENEFITS OF A NEW ENERGY ECONOMY



In the first part of this section, **we call for a national energy strategy that includes a set of guiding principles** and necessary ingredients, such as hard caps on emissions. We also describe some of the tools and approaches to build and maintain trust between participants as this strategy is developed—**strategies that can help the parties navigate potentially contentious issues**, such as nuclear power. We'll also highlight the need for transparency and fairness, adequate funding support, and necessary regulatory reform.



3.1 A NATIONAL ENERGY STRATEGY

The fact that Canada does not have a national energy strategy is surprising given that the country is so dependent on natural resources and that energy commodities are by far the most valuable of those resources. Our nation is well endowed with abundant sources of energy, including oil and gas, coal, hydroelectricity, nuclear, wind, solar, hydrogen, biofuels and geothermal. Canada is ranked as the world's fifth-largest energy producer, and is home to the world's second-largest oil reserves and the world's third-largest natural gas reserves.

As stated earlier in this paper, Canada is currently not well positioned in the transition to a new energy future. The ongoing leadership vacuum on energy issues in Canada is a product of a longstanding power struggle between Ottawa and the provinces that began in 1980 when the federal government of the day attempted to impose a National Energy Policy that would have restricted the province of Alberta's ability to make decisions on energy resource development within its own boundaries. Many elections and governments later, key jurisdictional issues on energy policy in Canada remain unresolved. This complexity currently hinders our ability to make effective and timely change.

Opportunities in Asia

According to the World Energy Congress, global demand for all forms of energy is expected to grow 36 percent between 2008 and 2035. The lion's share of this growth is expected to occur in China, which—owing to a combination of rising population, rapid industrialization, and urbanization—in 2009 overtook the United States as the world's top energy consumer. The International Energy Agency expects that China will contribute 36 percent of the increase in global energy use, its demand rising an estimated 75 percent between 2008 and 2035. India is responsible for the second-largest increase in global demand, accounting for 18 percent of the expected increase, and doubling its energy use over the same period. Canada's present response to this trend appears to be largely limited to ensuring our oil and gas producers have ready access to these markets. A new energy vision for the nation would develop a more diversified response, and identify export opportunities for Canadian innovation in energy services, renewables, and related technologies and products.

As the costs of maintaining this standoff between Ottawa and the provinces in a world now consumed by energy issues has become more apparent, the political incentive to find new ways to push past the impasse has grown. As a result, over the past 18 months we have seen a flurry of new activity by many groups, particularly industry and government, to address this situation.

Although these initiatives represent constructive contributions to a national consensus on Canada's energy future, many overlook issues such as a market price on carbon, which will internalize the now-hidden costs of fossil fuels with respect to their impact on ecosystems, human health, and the atmosphere. Many of the dialogues and discussion papers also neglect the required deep reductions in greenhouse gases and a timeline for the new-energy transition, including binding emissions reduction targets.

Given the sheer complexity of the task at hand and the central role that oil, gas, and coal presently play in the Canadian economy, a shift of this magnitude will not happen overnight. In fact, it probably will not happen within the next decade. While transformation needs to start immediately, it won't happen at all without a broad consensus that such profound change is needed, and a commitment to an aggressive strategy.

There is already widespread agreement that a centralized, top-down solution is not the answer. Instead, a national energy strategy, framework, agreement, or accord must reflect the varied interests of Canada's regional jurisdictions and sectors, and provide the incentives, guidance, coordination, and consistency necessary to achieve our energy vision and compete in the global new-energy economy.

We propose that a national energy strategy must:

1. Provide accessible, fair, and efficient energy services to Canada's present and future populations with minimal risk to future generations;
2. Create new jobs while ensuring the country remains competitive in the global market for new-energy technologies, systems, and services;
3. Reduce the risk of climate change by lowering carbon emissions 80 percent below 1990 levels by the year 2050;
4. Protect and restore Canada's air, land and water resources by setting hard caps on cumulative ecosystem and atmospheric impacts; and
5. Create a new reputation for Canada in the international marketplace as an energy leader, innovator, and solutions provider.

3.1.1 GUIDING PRINCIPALS

TABLE 2: Jurisdictional Comparison - Installed Capacity

Jurisdiction	Examples of Investments in Renewable Energy Solutions
Germany	Wind power installed: 26,000 MW (2010) PV installed: 5,400 MW (2008)
Spain	Wind power installed: 19,000 MW (2010) PV installed: 3,300 MW (2008)
Texas	Wind power installed: 9700 MW (2010)
China	Wind power installed: 35,000 MW (2010)
U.S. overall	Wind provided 40% of all new capacity in 2008 and 2009. Total installed wind power capacity: 36,000 MW (2010) Solar power capacity: 1,687 MW (2009) Ethanol production: 34 billion liters (2008)
EU overall	Wind power installed: 75,000 MW (2010)
Canada	Wind power installed: 3,250 MW (2010) PV installed: 94 MW (2009) Ethanol production: 0.9 billion liters (2008)

3.1.2 ESSENTIAL INGREDIENTS

A number of organizations and coalitions are presently circulating draft national energy frameworks and hosting a variety of dialogues on energy issues in Canada.¹⁸

Many of these documents and discussions capture much of the language of a new-energy economy, with calls for leadership and innovation to ensure competitiveness. They also recommend extensive new investments in energy services and renewables, smart grids and smart meters, as well as energy literacy programs and demand-side conservation measures. We agree that these are all important components of Canada's energy future. However, many of these frameworks and dialogues overlook a number of core tenets that are essential to any credible discussion of a future energy vision, as set out below.

Clear Targets and Mechanisms to Measure Progress

Any national energy strategy must establish clear, measurable, and binding targets.¹⁹ Application of such targets is appropriate, at minimum, for gross reductions of greenhouse-gas emissions, carbon intensity of electricity, fuel efficiency for vehicles, energy consumption standards for appliances, and performance-based standards for buildings. A strategy would establish such targets for each sector and sub-sector of our energy system, including transportation, the built environment, electricity production, energy utilization, and so on. It must also measure, track, and report impacts to water, air, land, and the atmosphere. Further, a strategy must define and track socio-economic indicators, to ensure that, for example, the new strategy is creating more jobs than it renders obsolete, and that we are providing aboriginal communities with equal access to new-energy solutions.



We must set these targets based on best available research and evidence, and stretch them to stimulate innovation. We must draw from the performance in other jurisdictions to ensure we remain competitive while taking into account our own unique situation. Targets should be set for five years, 10 years, and the year 2050. The 2050 target defines the ultimate vision and sets direction, while the five and 10-year targets represent short-term milestones to which today's decision-makers can be held accountable.

As a starting point*, any strategy must reinforce our existing domestic and international commitments, including:

- An absolute reduction of Canada's greenhouse-gas emissions to at least 17 percent below the 2005 level by 2020, Canada's commitment under the Copenhagen Accord;²²
- Limiting global average surface temperature increase to 2° Celsius above the pre-industrial level, as committed to under the Copenhagen Accord;²²
- Generating 90 percent of Canada's electricity from zero-emitting sources;
- Phasing out fossil fuel subsidies, as committed under the G20 process.²³
- Commitments under the United Nations Convention on Biological Diversity relating to the preservation of biodiversity and ecosystem services.

*These commitments, including the obligation to limit global average surface temperature rise to 2° above the pre-industrial period, are political in nature. Targets should be driven by science, not politics. We expect these commitments will be strengthened to reflect the growing scientific certainty with respect to the impacts of climate change.

Regional & Sectoral Diversity

Canadians take pride in their diversity, and our national energy strategy must respect and leverage this core value. Any strategy must support a range of approaches to realize the vision. Provinces and municipalities will draw upon a portfolio of laws and policies, economic instruments and tools that best allow them to translate the national energy strategy into effective action. Different regions and jurisdictions have distinct needs and potential contributions, and any national strategy must recognize and build upon—rather than detract from—these various strengths. Though the vision will be national, implementation will inevitably unfold at the local and regional level.

A Market Price on Carbon and Full-Cost Accounting

The policies that will make up a national energy strategy, agreement, or accord must account for the full costs of a given fuel or energy generation scheme across its life cycle, from extraction, through manufacturing, use, and eventual recovery of materials. Our present system regards ecosystem impacts as "externalities" that are not factored into the cost of doing business. Chief among these are the emissions associated with fossil-fuel combustion. Any national energy strategy must fully account for these impacts, primarily through a market price on carbon. Such a policy will bring the price of fossil fuels more in line with their cleaner counterparts, and drive market innovation towards cleaner energy services.

PHOTO OPPOSITE COURTESY MITSUBISHI MOTORS. THIS PAGE COURTESY CITY OF VANCOUVER.

3.1.2 ESSENTIAL INGREDIENTS

Our present system regards ecosystem impacts as "externalities" that are not factored into the cost of business.



3.1.3 EXAMPLES OF LEGAL AND POLICY TOOLS

A recent report concluded that nations with strong policies aimed at reducing global warming pollution and encouraging the use of renewable energy are establishing stronger competitive positions in the clean energy economy.²⁴ We can identify examples of the policy instruments and tools that might form some of the ingredients of a national energy strategy (see Table 3). Many of these policies and approaches have been used effectively in other jurisdictions. Our challenge will be to select from the best of these examples, adapt them to suit Canada’s unique circumstances and needs, and ensure that they function effectively in our market.

Taxation and Market Incentives

We need robust economic instruments to eliminate subsidies for polluting systems, ensure polluters pay the full cost for spills, leaks, and atmospheric releases, and fully value and reward actions that support the achievement of a new-energy vision. Full-cost accounting will drive innovation and investment towards the cleaner energy systems. As much as possible, the fiscal measures should be performance-based rather than technology-prescriptive.

Standards and Regulations

Performance-based energy standards and regulations for buildings, vehicles, appliances, and electronics, may help meet energy efficiency goals. Standards and regulations also offer a means to address large industrial polluters. To drive product innovation, we might consider the “top runner” approach employed in Japan. Under this strategy, the best performing model on the market sets the next required standard within a given number of years. Whatever approach is determined, clear and enforceable standards will provide both certainty for industry and the means to ensure we meet our goals.

Research and Development Programs

Canada must invest in research, development, and commercialization to identify and exploit our unique strengths in the global energy solutions market. This means establishing and funding research centers and graduate programs. President Obama recently proposed developing and funding such programs in his country by eliminating the subsidies given to fossil-fuel companies.

Government Procurement

Government purchasing power has historically helped drive adoption of emerging technologies. Wherever possible, our governments should purchase the technologies of the energy future we are striving for, and divest from less efficient and dirtier systems of the past.

Education and Outreach Programs

An effective national energy strategy will educate Canadians about energy use, production and the significance of the new-energy vision. Such energy literacy programs would include formal education (K-12 and post-secondary), as well as a digital program to connect with and host conversations with all Canadians.

TABLE 3: Examples of Potential Policy Instruments For Canada

Sector	Policy	Jurisdictional Level	Examples
Renewable electricity	Feed-in-tariff	Municipal / Provincial	Green Energy Act, Ontario; Germany
Vehicle efficiency	Corporate average fleet efficiency		
Feebates	National	European Union (5 L/100km by 2012)	France feebate program.
Urban planning	Liveable density		
Transit system	Municipal	British Columbia, Ontario, Europe	
Building codes	Minimum standards	National / Provincial / Municipal	LEED Gold for commercial; 50+% improvement from current norm for residential. California and Florida.
Electrical appliances	Top Runner Standard	National	Japan
Renewable heat	Feed in tariff and/or regulatory	National / Provincial / Municipal	Germany, UK, Israel
Electric Vehicles	Standards and Investments	National	US, China
Freight	Fleet efficiency standard	National	
Pollution pricing	Carbon levy	National	BC, Norway, EU
Limits on regional environmental impacts	Air, land, water – caps on cumulative impacts	National and Provincial/Regional	
Environmental reporting and monitoring systems	Air, land, water releases and consumption	National / Provincial	

3.1.3 EXAMPLES OF LEGAL AND POLICY TOOLS

Our governments should purchase the technologies of the energy future we are striving for.

3.2
A SUCCESSFUL ENERGY-STRATEGY DESIGN PROCESS



Energy touches the life and pocketbook of every Canadian

With general consensus that the time has come to create a national energy strategy, the first step will be identifying a suitable process. We believe that all stakeholders—including those representing the interests of civil society—must now come together to create both a national vision of Canada’s energy future and a coordinated strategy to get us there. This—and only this—will ensure our nation continues to prosper and compete through the global transformation that is already underway.

A vision and strategy for Canada’s energy future must not only drive near-term policy reforms to prepare us for the transition, but also endure across multiple governments, jurisdictions, and generations. The task will be far from straightforward. But we can say with confidence that the success of any such initiative will hinge directly on how carefully the underlying process is designed, supported, and implemented.

Energy is not only a complex inter-jurisdictional challenge for policy makers. It also touches the life and pocketbook of every Canadian. For this reason, the ultimate measure of success for any process to develop a vision or strategy for Canada’s energy future will be whether or not Canadians see themselves reflected within it. The longevity of any agreement is a direct result of the degree of ownership perceived among those the agreement will most affect. It will not be enough for federal or provincial decision makers to sign off on a given approach; everyone with an interest in the outcome must feel that their interests have been fairly addressed.

As stated earlier, the opportunities and risks of producing and consuming energy differ widely across Canada. Different regions have different priorities and concerns, and are endowed with diverse energy assets and barriers. Any effective collaborative process must be capable of wrestling with these differences in a fair and equitable fashion.

A well-designed energy planning process would not only involve a critical and representative mass of Canadians, but would also make a particular effort to involve often-marginalized groups, such as those already coping with the effects of climate change, and those most vulnerable to energy price shocks. The process will doubtless fail if we only engage elites and energy’s perceived “winners,” because its result will not be supported by a sufficiently wide range of constituents.

At a minimum, the design of an effective collaborative process must embrace the following principles of engagement:

Inclusivity

The process adopted for the development of a vision and strategy must engage all relevant sectors, regions, and communities in the energy system, via a diverse range of channels, including digital and face-to-face conversations. Such a process not only needs to engage many groups, interests and values, it also needs to meet Canadians “where they are” with respect to both physical location and their existing knowledge, understanding, and awareness.

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Transparency and Accessibility

All steps in the process must be transparent so that Canadians can understand what is happening, how their interests are being considered, and how they will participate in the key decisions that affect them. The process design must embrace multiple communications channels, and records of the proceedings must be made accessible in a timely manner and across multiple platforms.

Research Excellence and Rigour

The success of a collaborative process will depend in part on access to appropriate technical support and the very best science and research. Moreover, such support needs to overcome the stifling problem of “dueling science and economics,” and instead provide a single, independent source of information and analysis to inform discussions and decision-making.

Iterative, Adaptive, Enduring

Given the sheer scale and complexity of energy production and use, a collaborative process will need to be both iterative—allowing for multiple cycles of problem definition, analysis and experimentation—and adaptive, so that it is well matched to changing contexts and circumstances and well-equipped to revisit issues and areas as new information emerges. Such a process will also need to be longer term, able to outlast any single government, and capable of learning from its own successes and failures.

We are fortunate that Canada has a well-deserved reputation for designing and managing complex, collaborative multi-party processes of this nature. We will doubtless draw heavily on our international diplomacy skills, and the experience of those who have managed and led complex negotiations over land use, resource management, and other public policy issues.

3.2.1
DESIGNED FOR SUCCESS

The process will doubtless fail if we only engage elites and energy’s perceived “winners.”

3.3
WHAT
DISTINGUISHES
OUR
APPROACH



Any national energy strategy must include a credible plan to dramatically reduce greenhouse-gas emissions.

To summarize, our proposed approach to a national energy vision agrees with many others in that it includes a commitment to stronger energy literacy, conservation, and efficiency, as well as increased support for renewable energy. However, we are suggesting that the following three ingredients need to be embedded in any national energy policy, framework, strategy, or accord.

I. Deep Greenhouse-Gas Reductions

Any national energy strategy must include a credible plan to dramatically reduce greenhouse-gas emissions in a way that can be tracked, measured, and reported upon, while growing the nation's economy. These reductions should be 80 percent below 1990 levels by the year 2050, the target established by the global scientific community to head off the worst impacts of climate change. The strategy must recommend clear policies to drive this goal, including a market price on carbon. In our conversations across the country, across many sectors, the majority of participants advised us that science-based greenhouse-gas reductions should be embedded in any national energy strategy, along with other critical goals and principles.

II. Objective Research and Data

An energy plan must be based on the very best information and data informed by appropriate methodologies, tools and approaches. These include traditional macroeconomic modeling, back-casting, and scenario planning. Backcasting is a research methodology that involves stipulating an end-point—such as an aggressive greenhouse-gas reduction target—and working backwards to determine how best to reach it. Scenario planning and systems thinking help organizations reconcile a wide array of possible outcomes for a given strategy. The approach reveals how different perspectives and frames can inform our views of the future, and recognizes how unpredictable societal and economic forces can impact outcomes in unexpected ways.

III. Inclusive and Non-partisan Framework for Collaboration

An overhaul of our energy system within this century will demand the engagement of Canadians from all sectors and regions, including aboriginal peoples. Citizens will not accept a vision or plan created by any single sector. Further, because the process will exceed the life of any single government, it will need to be strictly non-partisan. It will also need to be characterized by regular, open reporting and information sharing. Finally, the process must be adequately supported, particularly with respect to the anticipated research, engineering, and scenario planning work.

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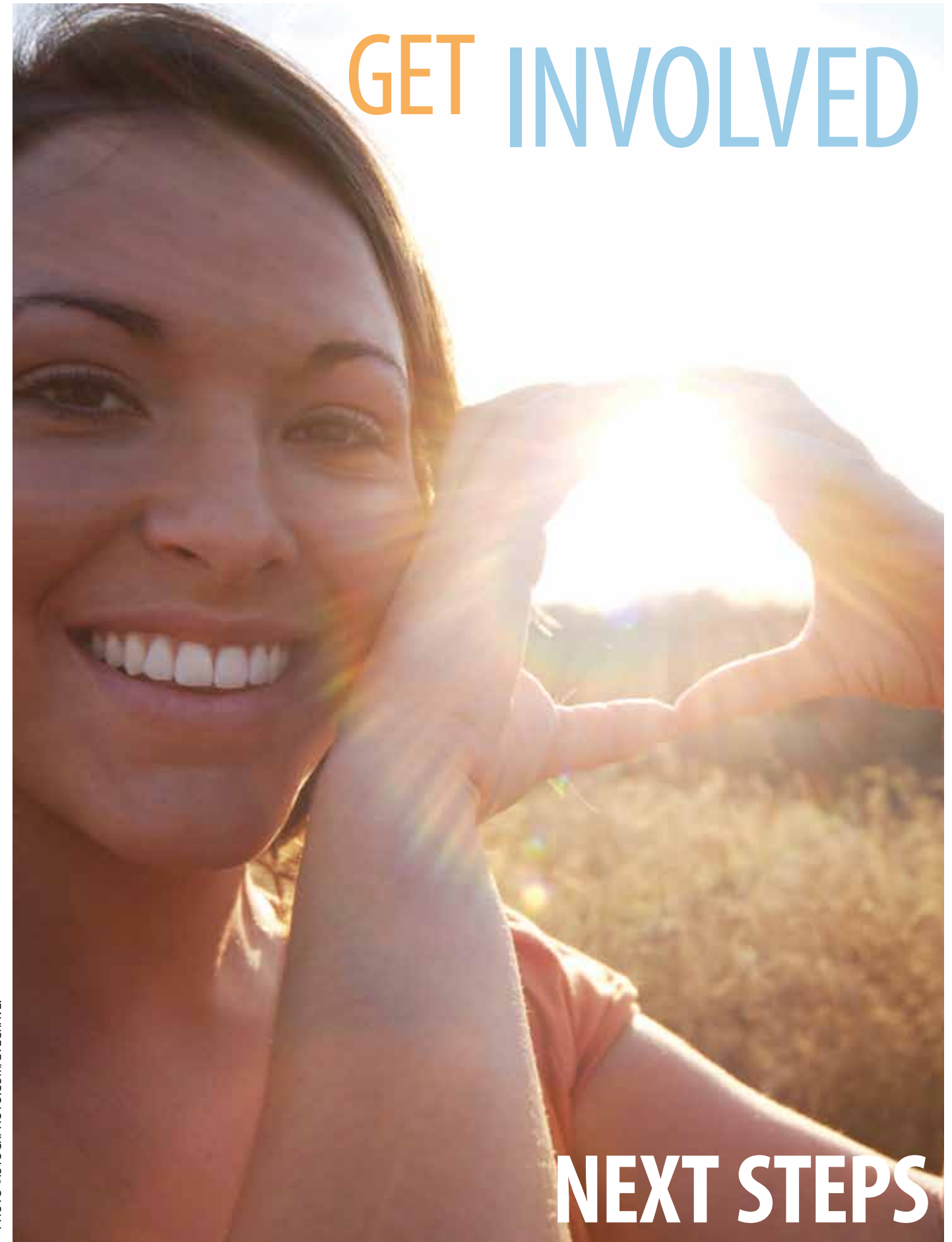
3.3
WHAT
DISTINGUISHES
OUR
APPROACH

Citizens will not accept a vision or plan created by any single sector.



4 NEXT STEPS

We hope to bring the ideas presented in this paper—specifically the need, scope, and process design parameters of a national energy strategy—forward into discussions of Canada’s energy future that are already underway. This coming summer, **leaders from the nation’s energy resources sector will meet** with provincial and federal governments and we expect the agenda will include a discussion of a national energy strategy. We recommend that **all parties interested in advancing this conversation now make a focused effort** to identify and design an appropriate collaborative multi-party process.



NEXT STEPS

4.1 HOW TO GET INVOLVED

We have a strong track record building successful outcomes from difficult challenges.

We think this country deserves a brighter energy future and we believe others share our vision. Over the coming months we will be working to build support for *A New Energy Vision for Canada*, and put in place the funding needed to advance the process forward. If your company, organization, or local government would like to endorse this vision and document, please get in touch.

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Tides Canada delivers “uncommon solutions for the common good.” With offices in Toronto and Vancouver, we are one of Canada’s most respected charities. For more than a decade, we have worked to support, convene, and directly fund hundreds of charitable organizations and initiatives, from neighborhood-scale programs to national organizations.

We have been involved in energy and climate work for some time. Some years back, we supported 3E (“Economy, Energy, and Environment”), an early multi-sector dialogue. We also sponsored British Columbia’s first cross-sector dialogue on climate change. In 2010, Tides began dedicating staff and resources to energy solutions work through a new Energy Initiative.

We have a strong track record building successful outcomes from difficult challenges. Chief among these is the landmark Great Bear Rainforest Agreement. Signed in 2006, the agreement now protects some two million hectares of coastal British Columbia, while providing new economic opportunities for coastal aboriginal communities. Tides Canada helped raise \$120 million from public and private sources in support of this agreement.

Largely as a result of this work, and our efforts to support other multi-party discussions and implementation initiatives—including support for the Canadian Boreal Forest Agreement—Tides Canada enjoys respect from multiple levels of government, aboriginal organizations, resource firms and other private-sector companies, academics, and nongovernment organizations.

NEXT STEPS

4.3 ABOUT TIDES CANADA

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ENDNOTES

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¹⁸ See "Clean Growth 2.0: How Canada Can Be A Leader in Energy and Environmental Innovation," Task Force on Energy, The Environments, And Climate Change, Canadian Council of Chief Executives, November 2010, available online at <http://www.ceocouncil.ca>. Also *ibid.*, Energy Policy Institute of Canada.

¹⁹ It is common practice to combine fiscal policy instruments with standard-setting and regulatory mechanisms. This is especially true in the area of energy and environment, where it is widely recognized that the pricing of carbon—although critical to drive consumer behavior change—is best complemented by performance standards placed on energy-consuming devices.

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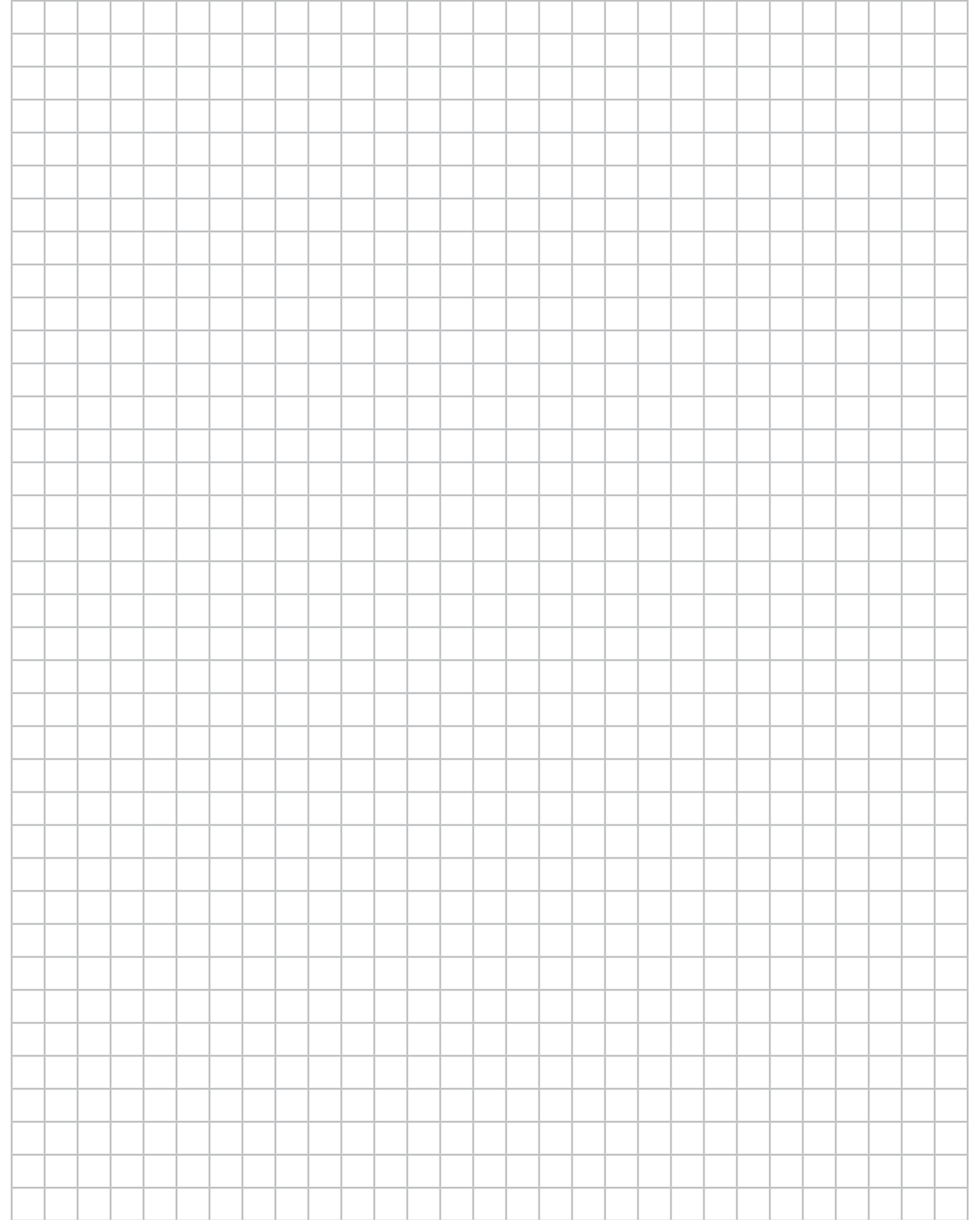
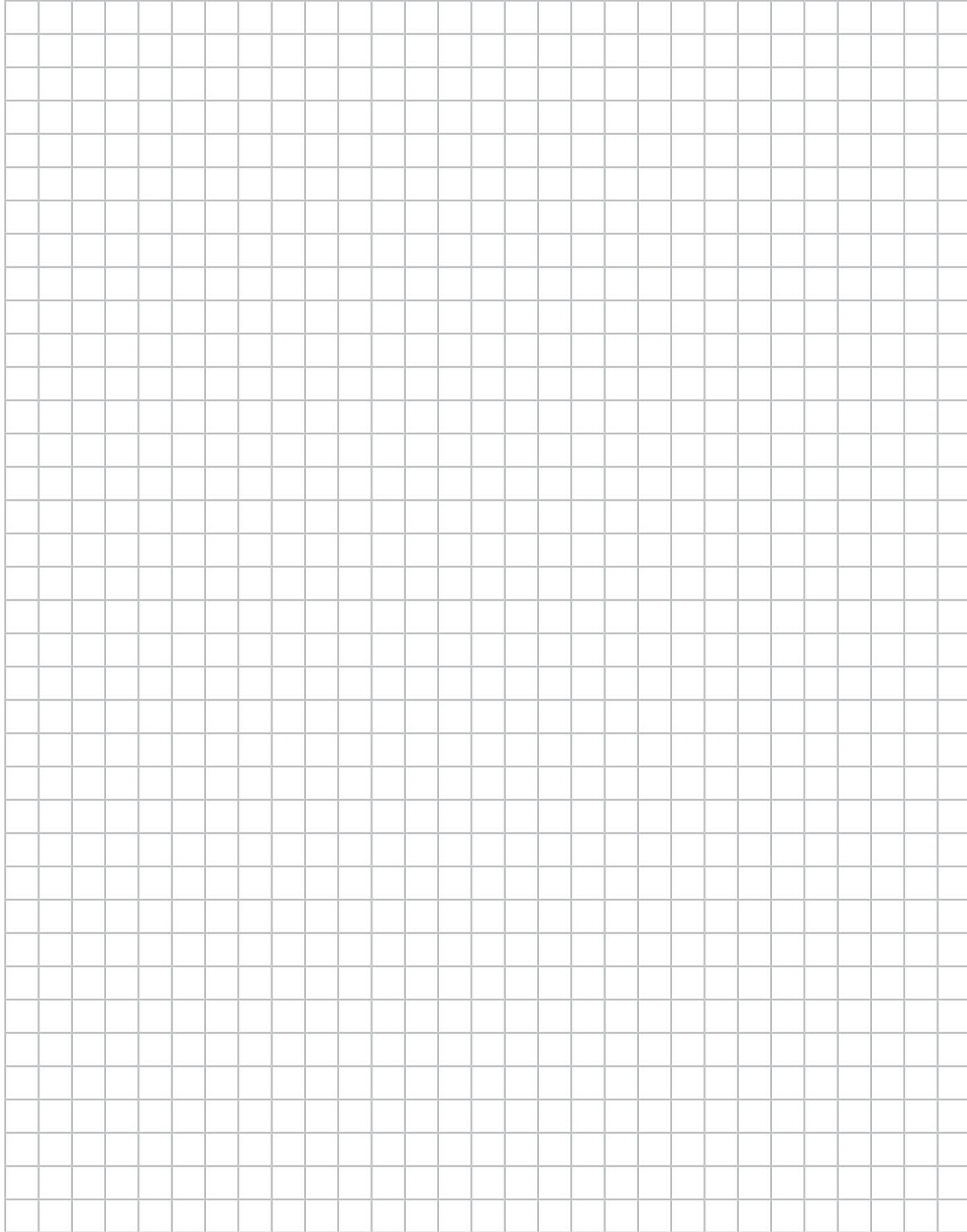
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ENDNOTES

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