

An Evaluation  
of the  
*Preliminary Hydrogen Opportunities Report*  
Manitoba Energy, Science & Technology

Manitoba Wildlands  
Winnipeg, Manitoba  
2004

1. **Overall Readability as a Document That Is Intended to Inform the Public About the Issue and Alternatives**

Documents submitted for public review should be written in a style that communicates with a broad audience who may not be experts in particular issue areas. Where a matter of public consultation is at issue, a list of definitions or a glossary of terms should be provided in the document.<sup>1</sup> In some circumstances, the document should be available in languages understandable to indigenous people.<sup>2</sup>

The *Preliminary Hydrogen Opportunities Report*<sup>3</sup> (*Report*) delves into technical and scientific matters. A non-expert reader might expect some level of background information to substantiate premises contained in the *Report*, yet throughout the *Report* this type of basic information is absent. A more complete analysis of the *Report*'s research and fact content is discussed in issue number three later in this memo.

Some key statements, or terms of art, in the *Report* may not be immediately understandable to a general readership, or a broad audience, for several reasons. In some instances where these types of statements or terms are used, the relevant context or definitions are absent. In other instances, the terms themselves are ambiguous, contradictory or raise more questions not addressed in the *Report*.

A few of the statements and terms at issue in the *Report* include: "core stakeholders"<sup>4</sup>, "multi-stakeholder"<sup>5</sup>, "No direct carbon emissions"<sup>6</sup>, "hydroelectric resources"<sup>7</sup>, "Clean hydrogen"<sup>8</sup>, "clean energy sources"<sup>9</sup>, "GJ (HHV)"<sup>10</sup>, "Hythane mixture"<sup>11</sup> (defined in

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<sup>1</sup> Letter from Gaile Whelan Enns, Manitoba Wildlands director, Canadian Nature Federation, to Honorable S. Ashton, Minister of Conservation, 4 (March 25, 2003) (citing the Manitoba Clean Environment Commission (CEC) Recommendation # 2 on "Understandability" and CEC support for making draft EIS guidelines available in Cree and other languages).

<sup>2</sup> *Id.*

<sup>3</sup> Manitoba Energy Development Initiative, Dept. of Energy, Science and Technology, *Preliminary Hydrogen Opportunities Report* (April 2003) [hereinafter *Report*].

<sup>4</sup> *Id.* at 9.

<sup>5</sup> *Id.* at 16.

<sup>6</sup> *Id.* at 15.

<sup>7</sup> *Id.*

<sup>8</sup> *Id.* at 17, 22.

subsequent section of the *Report*), “renewable energy strategy development in Manitoba”<sup>12</sup>, “Canadian stakeholder”<sup>13</sup>, “HVDC”<sup>14</sup>, “Theoretical prediction can be undertaken but is inadequate because of non-linearity”<sup>15</sup> and “GST or PST”.<sup>16</sup>

Given how the *Report* uses the terms and statements cited above, a reader may be left wondering who the “core stakeholders” are and whether they are similar to, or differ from, a “multi-stakeholder” or “Canadian Stakeholder”. The ambiguity that surrounds these terms and the *Report* consultation process itself can chill involvement by citizens and non-governmental organizations not already represented in the Steering Committee and Working Groups.

Thus, the *Report* should be much more user friendly and understandable. A more user friendly document could better serve to inform the public about the issues, alternatives and opportunities to participate in a consultative process to help bring about an appropriate hydrogen economy.

**Recommendation:**

Expand the definition section (2.5) or include a glossary of terms in a revised *Report*. Use language that is understandable to citizens. Test some writing samples to determine whether they effectively communicate with the general public. Make the document available in languages that can be understood by Indigenous People.

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<sup>9</sup> *Id.* at 21.

<sup>10</sup> *Id.* at 25.

<sup>11</sup> *Id.* at 26.

<sup>12</sup> *Id.* at 34, 40, 52, 54.

<sup>13</sup> *Id.* at 42.

<sup>14</sup> *Id.* at 43.

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* at 53.

## 2. Composition of the *Report* Committees

Achieving sustainability is not primarily a technical or scientific challenge – although there is much to learn about how ecosystems work and respond to human activity. Nor is the challenge merely to manage resources more effectively, although there is much room for improvement in that too. Rather, it is about dealing with people and their diverse cultures, interests, visions, priorities, and needs.<sup>17</sup>

Non-governmental organizations play a vital role in the shaping and implementation of participatory democracy. Their credibility lies in the responsible and constructive role they play in society. The nature of the independent role played by non-governmental organizations within a society calls for real participation; therefore, independence is a major attribute of non-governmental organizations and is a precondition of real participation.<sup>18</sup>

One model for working crossroads of ecosystems, society and sustainable development is set forth by the Canadian National Round Table on the Environment and the Economy (NRTEE). The NRTEE has developed a consensus process where “all those who have a stake in the outcome aim to reach agreement on actions and outcomes that resolve or advance issues related to environmental, social, and economic sustainability.”<sup>19</sup> Building consensus for a sustainable future, as outlined by NRTEE, includes 10 principles. Two principles are especially relevant here: (A) be inclusive such that all parties with a significant interest in the issues should be involved in the consensus process and (B) acceptance of diverse values, interests, and knowledge of the parties involved in the consensus process.<sup>20</sup>

Hydrogen development is linked to sustainability and has many facets including economic, technical, environmental and social. Hydrogen development has the potential to impact many lives and the environment for a long time. While the *Report* is

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<sup>17</sup> Gerald Cormick, Norman Dale, Paul Emond, S.Glenn Sigurdson & Barry D. Stuart, *Building Consensus for a Sustainable Future: Putting Principles into Practice*, 3 (1996) [hereinafter *Principles*].

<sup>18</sup> United Nations, Agenda 21 Chapter 27, Strengthening the Role of Non-Governmental Organizations: Partners for Sustainable Development, at <http://www.unep.org/Documents/Default.asp?DocumentID=52&ArticleID=75>.

<sup>19</sup> *Principles* at 4.

<sup>20</sup> *Id.* at 7.

about hydrogen and related technical and scientific matters, it acknowledges broader issues as it speaks about movement toward “increased use of renewable energy sources”<sup>21</sup>, sustainable transportation<sup>22</sup> and a “broader renewable energy strategy development in Manitoba.”<sup>23</sup>

Despite the magnitude of the issues presented by the *Report*, and the concern expressed that other technologies need to be evaluated in the context of a renewable energy strategy, no direct *Report* linkage could be found for an overarching provincial energy policy, a bedrock principle like sustainability, or other water and environmental protection policies. Perhaps the closest statement of a guiding principle is the hydrogen focus vision statement – “Become, over the next 20 years, the leader in the provision of products, services and technologies that will contribute to a cleaner energy economy, particularly one based on renewable hydrogen.”<sup>24</sup>

The preliminary assessments of hydrogen-related opportunities for Manitoba was done by the Manitoba Hydrogen Steering Committee and Manitoba Hydrogen Working Groups.<sup>25</sup> The Steering Committee and Working Groups have representation from several business, governmental and academic sectors including a manufacturer of buses and hydrogen fueling systems, governmental energy divisions, and the Universities of Manitoba and Winnipeg.<sup>26</sup>

Absent, however, from the Committee and Working Groups, are interested citizens, community representatives, non-governmental organizations, and indigenous people. These people and non-governmental organizations can, however, play a constructive role in helping to bring about environmentally sound and sustainable development. Greater diversity on the Steering Committee and Working Groups may hold potential to more fully inform the decision making process and help to ensure a positive direction for appropriate hydrogen development.

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<sup>21</sup> *Report* at 4.

<sup>22</sup> *Id.* at 53.

<sup>23</sup> *Id.* at 40 (discussing energy technologies other than hydrogen fuel cells and stating that they need to be evaluated in context of the renewable energy strategy but not providing citation for that strategy).

<sup>24</sup> *Id.*

<sup>25</sup> *Id.* at 58 - 60.

<sup>26</sup> *Id.* at 48, 58 - 60.

**Recommendation:**

Include Indigenous People, interested citizens and non-governmental organizations in the process of exploring hydrogen opportunities. Enable their meaningful participation in the process. Provide adequate funds for their time used to prepare for, travel to and participate in meetings; transportation expenses; and related travel expenses such as lodging and meals. Convene meetings at times and in locations that will ensure broad participation. Facilitate meetings so as to enable participants to provide meaningful input, make the process transparent and synthesize and use enhanced input from participants.

3. **Level of Research or Fact Gathering Contained in the Report**

A preliminary assessment having such far-reaching implications as suggested by the *Report* should share with the reader some facts or research underlying various premises. The *Report*, for example, uses various terms and makes assumptions without providing a full explanation. For example, the term “No direct carbon emission” begs the question as to whether or what role indirect carbon emission may play in the analysis. This may be an important factor in assessing whether hydrogen is indeed “clean when produced from hydroelectricity”,<sup>27</sup> since information from Manitoba Hydro and outside observers indicate that significant social and environmental challenges caused by hydroelectricity production remain to be resolved.<sup>28</sup> Neither present concerns about ongoing environmental harms associated with continued operation of existing hydroelectric systems nor concerns over proposed new developments are addressed in the *Report*.

The following matrix identifies some premises in the *Report* and notes whether adequate facts or supporting research are supplied in the *Report*. This is not meant to be an exhaustive analysis of the *Report*.

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<sup>27</sup> See *Report* at 24 and Press Release, Manitoba News Media Services, Province Releases Hydrogen Opportunities Report (April 16, 2003) (on file with author).

<sup>28</sup> See, e.g., Manitoba Aboriginal Rights Coalition, *Report of the Interchurch Inquiry into Northern Hydro Development*, 1-3, 9-12 (November 2001) (discussing the ongoing social and environmental harms associated with the Churchill-Nelson Hydroelectric Project) [hereinafter *Interchurch Inquiry*]; Manitoba Hydro, *Environmental Impacts*, at [http://www.manitobawaterpower.com/environmental\\_impacts.html](http://www.manitobawaterpower.com/environmental_impacts.html) (stating some adverse environmental effects due hydroelectric development and the concomitant impoundment of water, flooding and alteration of seasonal river water flows); and Minnesotan’s for an Energy Efficient Economy, *JustEnergy, Images of the Environmental Damage*, at <http://www.justenergy.org/images/EnvironmentalDamage/index.html> (showing some ongoing environmental effects from hydroelectric development in Manitoba).

<b>Premise/ Page Number</b>	<b>Supporting Research or Facts Underlying Premise?</b>
"The most obvious connection to a Manitoba clean energy future is the hydroelectric resources of the province..."/ 4	No
Hydrogen economy leads to increased use of "renewable energy"/ 4	No
Stakeholders; multi-stakeholder approach / 9	No
Market Growth Trend/ 13	No
Market drivers, clean hydrogen produced from clean sources/ 17	No
Export markets & distributed sites/22	No
Hydroelectricity as lowest cost source of clean renewable electricity for electrolysis/24	No
Purported benefits of using Manitoba Hydroelectric resources/25	No
Midwest U.S. hydrogen markets/26	No
Overview of transportation – heavy & light duty applications/28	Yes
Overview of stationary fuel cell applications/35	Yes
Distributed generation/ 38	No
Implications of increased sodium chlorate production/ 40	No
Broad area of research gaps/ 43	No
Cleaner or greener production technology; energy source/ 45	No
Hydroelectric resources to produce renewable hydrogen/ 48	No
"The most obvious connection to a Manitoba clean energy future for transportation and portable power is the hydroelectric resources of the province...to produce clean hydrogen."/ 55	No
Implications of electricity export for so-called clean hydrogen production/ 57	No

**Recommendation:**

Use footnotes, endnotes or other citation in a revised *Report* for easy reference to source documents and policy statements and positions. Research and reference a variety of source information that may support or contradict premises so the public and policymakers can be fully informed and empowered to make knowledgeable and informed decisions about the range of relevant issues, alternatives and opportunities.

4. **Objectives and Degree to Which They Are Consistent With, or Otherwise Foreclose, Stated Energy Policies**

The *Report* includes a preliminary Manitoba hydrogen economy vision statement that underscores the important role water could play in that vision. In the vision, water could be both the primary energy source for generating electricity to produce hydrogen and the raw material for direct electrolysis. See, for example, the following excerpts:

Manitoba has begun the process to develop a Hydrogen Economic Development Strategy, with a vision to: Become over the next twenty years the leader in the provision of products, services and technologies that will contribute to a cleaner energy economy, particularly one based on renewable hydrogen.<sup>29</sup>

The most obvious connection to a Manitoba clean energy future is the hydroelectric resources of the province, which when combined with water electrolysis technologies provides the ability to produce clean hydrogen.<sup>30</sup>

Given its current hydroelectric advantage, Manitoba could be the first jurisdiction in North America where large-scale electrolysis production of hydrogen becomes cost efficient.<sup>31</sup>

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<sup>29</sup> *Report* at 4.

<sup>30</sup> *Id.* See also, Manitoba Energy Development Initiative, The Hydrogen Report, at <http://www.gov.mb.ca/est/energy/hydrogen/report.html> .

<sup>31</sup> *Report* at 55 (describing the long-term hydrogen potential based on using the hydroelectric resources of the Province).

Left out of the *Report*, however, is essential information about the interplay of science and public policy. The *Report* lacks integration because the reader is left to piece together what might be key relevant factors such as ecosystems and provincial, federal and international energy, environmental and climate policies. Inconsistent positions and lack of continuity between the realm of science and policy is left unexplained.

For instance, while the *Report* considers using water as both a raw ingredient and an energy resource, it seems to be disconnected from a provincial mission is to “be a leader in integrated water and land use planning and management on a watershed basis.”<sup>32</sup> While the *Report* was put together with no apparent involvement of interested citizens and non-governmental organizations, the Manitoba Water Strategy calls for “a participatory process that considers both present and future demands on our water, and ensures the protection of ecosystems.”<sup>33</sup>

Also missing in the *Report* is any discussion about the anticipated effect climate change will have on the water resource. On the one hand, according to the *Report*, water is a significant factor because it may be both a raw material and an energy source to generate electricity used to produce hydrogen. On the other hand, there is serious question about the future availability of an adequate water resource.

At the broader level of analysis, the Canadian government states, “Climate change is also expected to have an impact on Canada's water resources. Water levels in Canada's southern lakes are expected to decline, potentially affecting the quality of our drinking water, our use of the lakes for transportation and recreation, our ability to generate hydroelectric power, and our fisheries.”<sup>34</sup>

Yet another issue absent in the *Report* is the ongoing effects of hydroelectric generation. A synopsis of the problem is found in the *Report of the Interchurch Inquiry into Northern Hydro Development*:

The untallied cost of electricity production in northern Manitoba has been two decades of extensive environmental destruction, violation of human rights, and even the loss of life. For Manitoba Hydro, the governments, and consumers, the project is a success, but in northern Manitoba, it constitutes an ongoing ecological, social, and moral catastrophe.

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<sup>32</sup> Water Branch Manitoba Conservation, *The Manitoba Water Strategy*, 3 (April 2003).

<sup>33</sup> *Id.* at 19.

<sup>34</sup> Government of Canada, Canada and the Kyoto Protocol: The Science and Impact of Climate Change, at [http://climatechange.gc.ca/english/whats\\_new/science\\_e.html](http://climatechange.gc.ca/english/whats_new/science_e.html) .

Opportunities to extend the success of the hydroelectric project to all peoples include the restoration of damaged ecosystems and the socioeconomic recovery of affected communities.<sup>35</sup>

At least two other guiding elements have been left out of the *Report*. The Kyoto Protocol and the Precautionary Principle. The Kyoto Protocol, for example, is about promoting sustainability and includes provisions toward that end. It recognizes that while various actions may be taken in the name of sustainability or for promoting renewable energy, those policies and other measures must be done in a way that will minimize adverse effects to climate, trade and the environment, as well as to other parties.<sup>36</sup>

Manitoba has a plan to address Kyoto targets.<sup>37</sup> And the Province of Manitoba acknowledges the water quality in its jurisdiction may be in jeopardy due to climate change and unpredictable water volumes of lakes and rivers. Yet at the center of the hydrogen future is the future development of more hydroelectric capacity.<sup>38</sup>

Under Article 2 of the Kyoto Protocol, policies and measures to attain the greenhouse gas emission objective, as acknowledged by Manitoba, are to be implemented. The Protocol, however, calls for the protection and enhancement of greenhouse gas sinks located, for instance, in Manitoba's forests. Therefore, ongoing social and environmental harms caused by hydroelectricity, especially in the Boreal Forest, seem to be inconsistent with the broader aims of the Protocol.

Lastly, the Precautionary Principle is not addressed in the *Report*. The Principle is this:

In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.<sup>39</sup>

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<sup>35</sup> *Interchurch Inquiry* at 3.

<sup>36</sup> Government of Canada, Kyoto Protocol Article 2, at [http://www.sdinfo.gc.ca/docs/en/kyoto/kyoto\\_2.cfm](http://www.sdinfo.gc.ca/docs/en/kyoto/kyoto_2.cfm) .

<sup>37</sup> Province of Manitoba Climate Change Action Plan, *Kyoto and Beyond: A plan of action to meet and exceed Manitoba's Kyoto targets* (2002).

<sup>38</sup> *Id.* at 12.

<sup>39</sup> Environment Canada, *The Environment Canada Policy Research Seminar Series, New Body*  
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Under the Precautionary Principle there is an obligation to prevent environmental degradation. Some of the hydrogen vision may need to be reconciled with other important sustainability goals and policies especially where an energy source used to produce hydrogen is causing, or poses a threat of, serious or irreversible damage to ecosystems, including the Boreal Forest. Hydrogen, per se, as a source of energy may not be inconsistent with energy, environmental and sustainability objectives; however, the ongoing social and environmental problems associated with current hydroelectricity operations, and any similar challenges that might arise from further hydroelectric development, put into question whether hydrogen is truly a clean energy if it is generated with an energy source that causes harm to people, boreal forest ecosystems and carbon sinks.

**Recommendation:**

Convene a panel of interested citizens, indigenous people, representatives of non-governmental organizations and scientists to further examine and report on the issues raised in this analysis.

**5. Market Factors, Energy Sources and Economic Development**

The *Report* sets forth a near, medium and long-term developmental framework.<sup>40</sup> One of the issues presented outside these time frames, and in the context of production technologies, is the “Potential export of electricity for production of clean hydrogen at distributed sites in export markets, but with the need for associated premium for clean fuel production.”<sup>41</sup> This notion of exporting electricity also appears in the near term time frame.

The *Report* considers export of electricity for small-scale production of clean hydrogen fuel in export markets. One of the conclusions drawn in the *Report* is, under four

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of Law Emerges: The Law of the Environment, at [http://www.ec.gc.ca/seminar/Piette\\_e.html](http://www.ec.gc.ca/seminar/Piette_e.html) (explaining three guiding principles of environmental law (polluter pay, prevention and precautionary), stating the goal of the precautionary principle is to protect civil society against possible or probable hazards and referring to the Rio Declaration on Environment and Development (1992) provision where lack of full scientific certainty shall not be used as a reason to postpone cost-effective measures to prevent environmental degradation involving a threat of serious or irreversible damage).

<sup>40</sup> *Report* at 10.

<sup>41</sup> *Id.* at 22.

conditions, "An opportunity may exist starting in the near term to promote exports of Manitoba electricity, for the production of clean hydrogen."<sup>42</sup>

Location of electricity export markets is left open in the *Report*. However, under the discussion about production and export of industrial grade hydrogen from Manitoba, the *Report* presents the possibility of starting in the near to medium-term "the production of high purity hydrogen within Manitoba via electrolysis for export, primarily to midwest U.S. markets."<sup>43</sup> Under either the electricity or hydrogen export scenario, some transmission system will be required to carry the product to market.

Despite the conclusions about the export markets, absent in the *Report* is any discussion about the capability of those markets to use local energy resources to, for instance, generate electricity or produce hydrogen. Given the Midwest U.S. markets are discussed in the *Report* with respect to at least a hydrogen market, it may be worth noting some relevant features in that market.

One energy future envisioned for the upper Midwest U.S. is outlined in the Job Jolt report. The vision "is a blueprint for producing economically and environmentally sound power by unleashing the Midwest's home-grown clean energy potential."<sup>44</sup> This blueprint "promotes modern, energy efficient technologies and development of renewable energy resources, especially wind power and biomass energy."<sup>45</sup> In Minnesota alone, this plan is expected to produce over 7,900 new jobs above a business as usual scenario and \$ 600 million dollars in increased economic output by 2010.<sup>46</sup> For the 10 state Midwest region, the projections are for more than 200,000 new jobs and up to \$20 billion in increased economic activity.<sup>47</sup>

The U.S. Department of Energy, and industry trade groups such as the American Wind Energy Association, provide detailed information about wind potential and wind capacity

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<sup>42</sup> *Id.* at 24 (citing four conditions: premiums need to be obtained; legislative requirements for clean hydrogen need to be implemented in user jurisdictions; markets need to be found and reached; and implications of open access rules need to be addressed).

<sup>43</sup> *Id.* at 26.

<sup>44</sup> Regional Economics Applications Laboratory for the Environmental Law and Policy Center, *Job Jolt*, 2.

<sup>45</sup> *Id.*

<sup>46</sup> *Id.* at 7 - 8.

<sup>47</sup> *Id.* at 2.

in the United States. According to the American Wind Energy Association, the combined wind potential in, for example, Minnesota and Iowa is 460,000 megawatts.<sup>48</sup> The wind energy potential average number of megawatts for Minnesota is about one-third the potential or about 75,000.<sup>49</sup>

Depending on the particular export market, it may have the capacity to meet or exceed its own electricity needs through electricity efficiency and the use of local renewable energy resources. These types of market situations could affect the need for distant electricity generating, and long transmission, systems for either electricity or hydrogen. The social, economic and environmental benefits are expected to be large as outlined in the Job Jolt report.

**Recommendation:**

Convene a panel of interested citizens, representatives of non-government organizations, indigenous people, leaders in the fields of energy efficiency, and alternative energy and policymakers to investigate and consider the well energy resources already available or mandated to become available in potential export markets, as well as how this may affect energy policy and decision making in Manitoba.

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<sup>48</sup> American Wind Energy Association, Vast Wind Potential in the Great Plains (2000), at [http://www.awea.org/outlook2000/outlook\\_8.html](http://www.awea.org/outlook2000/outlook_8.html) .

<sup>49</sup> American Wind Energy Association, Small Wind in Minnesota (2001), at [http://www.awea.org/smallwind/minnesota\\_sw.html](http://www.awea.org/smallwind/minnesota_sw.html) .