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Supplementary Information
Oral intervention

Presentation from
Sandy Greer

In the Matter of

Ontario Power Generation Inc.

Proposed Environmental Impact Statement for OPG's Deep Geological Repository (DGR) Project for Low and Intermediate Level Waste

Joint Review Panel

September 16 to October 12, 2013

Renseignements supplémentaires
Intervention orale

Présentation de
Sandy Greer

À l'égard de

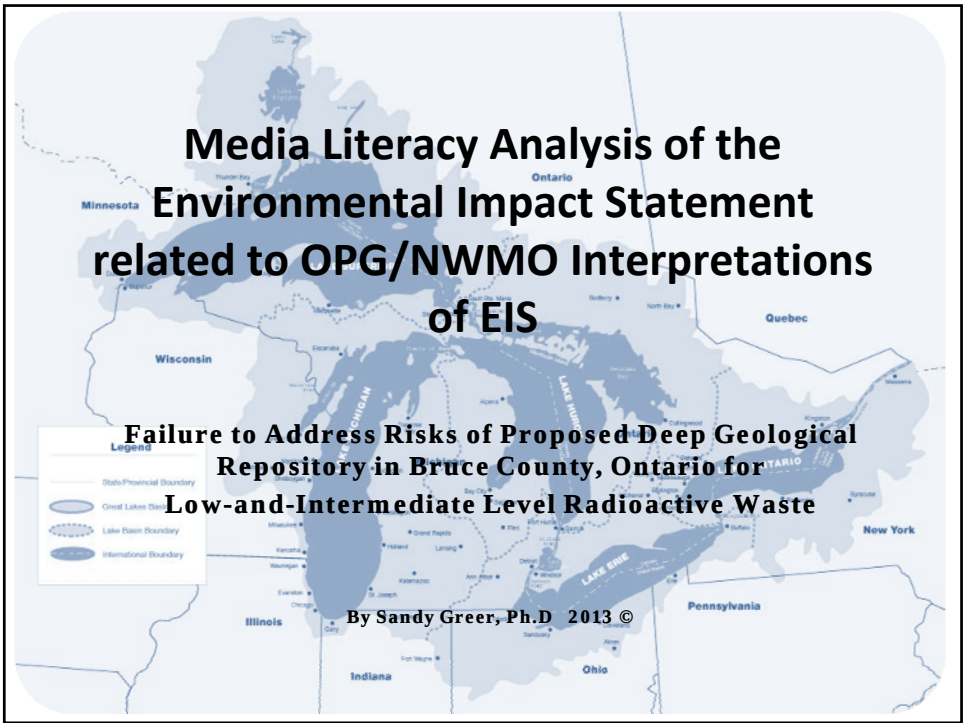
Ontario Power Generation Inc.

Étude proposée pour l'énoncé des incidences environnementales pour l'Installation de stockage de déchets radioactifs à faible et moyenne activité dans des couches géologiques profondes

Commission d'examen conjoint

Du 16 septembre au 12 octobre 2013

Canada



Media Literacy Analysis of the Environmental Impact Statement related to OPG/NWMO Interpretations of EIS

Failure to Address Risks of Proposed Deep Geological Repository in Bruce County, Ontario for Low-and-Intermediate Level Radioactive Waste

By Sandy Greer, Ph.D 2013 ©

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Please note that further details are available in fuller written submission to CEAA public record.

Great Lakes St. Lawrence River Basin

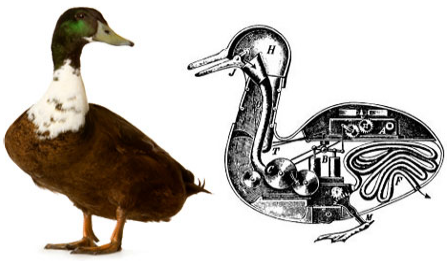
1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.1 All media are constructions

Media do not present simple reflections of external reality. They present `cultural productions' which have specific purposes.

Scientific inquiry is a `construction.' Science is not value neutral, but instead framed, first of all, within a specific cultural worldview, i.e. Euro-western, Indigenous, Eastern.

> *"The predominant framework of western science is mechanistic and reductionist. The machine metaphor in biology dates back to Descartes' concept of the body as machine, separate from the mind."*
>
> [Science in Society website, "Towards a Convention on Knowledge]



1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.2 The media construct reality

The media present attitudes, interpretations and conclusions already built in. We need to learn how to see the seams of constructions.

Environmental Impact Statement (EIS) guidelines state what is and what is not included for consideration by a proponent of a project, i.e. OPG for the proposed DGR, impacting on the environment. An EIS, therefore, is a `cultural production' that "constructs reality."

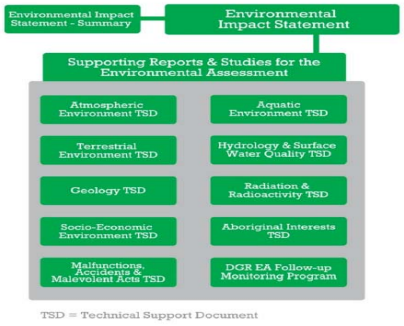


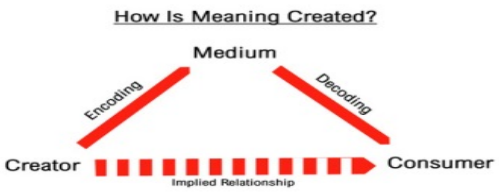
Figure 1: Environmental Assessment Document Roadmap

1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.3 Audiences negotiate meaning in media

We are not passive recipients of information, but rather actively negotiate what a `media text' means to us, often doing so on an unconscious level. We need to understand our own `subjectivity,' as well as the factors that cause different people, individually or culturally, to `read' a text in a way different from our own.

The OPG response to the EIS has been received in vastly different ways, from `dominant' to `oppositional' discourses in accordance with how various community members envision benefits versus dangers. A related, and controversial, issue here is how the OPG has misrepresented a consensus among citizens to which other interveners will speak.



1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.4 Media have commercial implications

The economic basis of mass media production includes content, techniques and distribution. Commercial media are businesses and must make a profit. Advertisers choose specific media that target specific audiences.

The economic implications of the proposed DGR are problematic, tightly intertwined with the self-serving economic and political vision of Bruce County mayors and most councillors, which other JRP hearing interveners will question.

The OPG's envisioned relatively small number of jobs suggested over a limited period of decades, even with spin-off impacts in the wider community, still offer a temporary, and limited, economic benefit for the few that sharply contrasts with the risk of compromising health and a safe environment for the many - permanently.

1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.5 Media contain ideological and value messages

All media products (and services) are advertising in some sense for themselves, yet also for values or a way of life. They usually affirm the existing social system.

BusinessDictionary.com defines `ideology' as: "Systems of ideas that explains and lends legitimacy to actions and beliefs of a social, religious, political, or corporate entity."
Wikipedia's definition of `ideology,' in the section "Analysis" reads: "Meta-ideology posits that ideology is a *coherent system of ideas*, relying upon a few basic assumptions about reality that may or may not have factual basis, but are subjective choices that serve as the seed around which further thought grows."

The international scope of nuclear energy players, therefore, could be characterized as believers and practitioners engaged in a specific ideology of how the world should operate through the engine of nuclear energy. The International Atomic Energy Agency (IAEA), for example, in Article II of its Statute: "The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world."

An example of the pro-nuclear bias specifically within the EIS guidelines is in sub-section 7.3 Alternative Means of Carrying out the Project, which reads:

> "*The alternative `reduction at source' represents the ways in which OPG could reduce the waste generated during the operation of the existing nuclear power generating stations* ***but does not represent consideration of abandoning nuclear power*** [my emphasis]."

1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.6 Media have social and political implications

The mass media may not be directly responsible for creating values and attitudes that have a broad range of social and political effects. Regardless, the mass media serves to legitimize and reinforce them. How, why, and who benefits, are key questions to ask.

Globally and locally the dominant role of, and expected affluent way of life enhanced by, nuclear power in the lives of citizens across nation states has become the norm to which some so-called `developing' countries now aspire. Advertising campaigns by corporations and governments, of course, are one form of `cultural production' to promote nuclear energy and reinforce such aspirations.

1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.7 Form and content are closely related in the media

Central to this awareness is the proposition advanced by Marshall McLuhan that each medium has its own grammar and codifies reality in unique ways.

After reading hundreds of pages of EIS documents and OPG/NWMO responses in their publications, a distinctive pattern of formatted repetition became evident, a pattern mirrored by their chosen - so-called "independent" - research contractors. What looks apparent is that the OPG/NWMO prepared all research templates - not already laid out in the EIS guidelines – to which the researchers merely filled in the blanks with various degrees of informational data.

The conclusion reached by the intervener is that all communication is tightly constructed and controlled, which raises the question about how much original thinking actually is encouraged to investigate beyond habitual attitudes and approaches to conventional nuclear knowledge, in order to ensure best practices applying the most recent knowledge.

Such a hard-wired, linear presentation of information that focuses on convincing the reader about the safety of the proposed DGR, ultimately, rings hollow. The foremost reason is the difficulty to find acknowledgments about the potential risks and dangers.

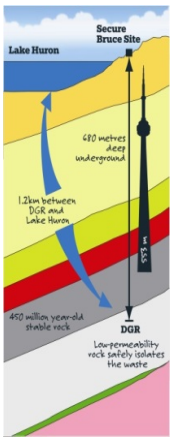
1. MEDIA LITERACY CONCEPTS – RELATED TO EIS

1.8 Each medium has a unique aesthetic form

Enjoyment of media is enhanced by pleasing forms and effects, and understanding how and why they impact on us develops critical autonomy within consumers and citizens. Doing so means learning how to `deconstruct' what is being signified or symbolized, and identifying what are the `signifiers' or `codes' that create the media, i.e. visual, written.

The OPG and NWMO create a variety of documents for different purposes. Aside from the aforementioned EIS detailed documents, another example of `cultural production' includes the publications for the wider public, which variously can be identified from educational to public relations, among other possible document descriptions by readers.

Such materials are visually attractive and user-friendly, using large full-colour imagery on glossy paper, and presented as professional, and authoritative, information resources, to impress readers and persuade them that the content is high quality and, most of all, trustworthy.



2. `DOMINANT' and `OPPOSITIONAL' VIEWS

We are dealing with the circumstances of a `dominant' discourse versus an `oppositional' discourse – in media literacy terms – being played out in this region of Midwestern Ontario – Bruce County.

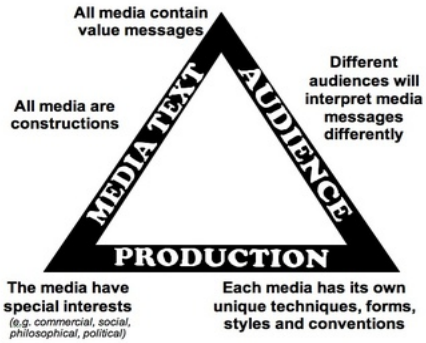
The `dominant discourse' or perspective comes from the nuclear industry, represented by the OPG and the NWMO. This perspective is reinforced by the presence of Bruce Power as a significant regional employer with obvious, subsequent social, economic and political influences. For reasons of its privileged position of power, and deep financial pockets, the dominant view, in turn, finances an incredibly powerful public relations campaign to acquire stakeholder support.

The `oppositional discourse' includes organizations outside of the nuclear industry, and concerned citizens as individuals or groups, with severely limited financial resources. The latter, even so, feel compelled to do independent scientific and related research, largely because local political councils have abdicated their moral responsibility to do so. We believe in the right and responsibility to participate in much more inclusive dialogues and debates, which this public hearing exemplifies.

3. DILEMMA of HUMAN SUBJECTIVITY vis à vis SCIENCE

The EIS guidelines and OPG/NWMO responses present to us a `cultural production' of scientifically-based data whose `subjectivity' is based on justifying a proposed DGR for low and intermediate level nuclear waste.

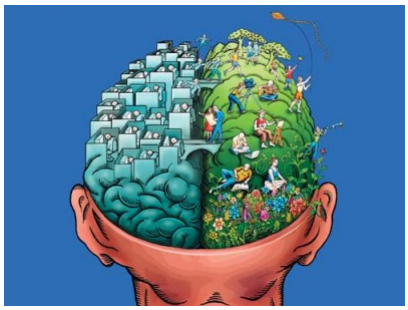
The producers include authors of the EIS guidelines and the proponent collectively as OPG and the NWMO. They apply the `subjective' lens of a "pro-nuclear worldview" in a `media text' that sees local citizenry as a "hosting community" and location of proposed DGR as a "project site."



3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

To understand subjectivity in scientific inquiry, we need to look at the bigger picture of "cultural worldviews" beyond professional training, that is, how we are socialized, who and what we value, and why.

The intervener, after years of research, agrees with maverick thinkers: Euro-western culture, systemically, has a `fractured consciousness.' This rupture severed our covenant with Earth as well as Spirit.



fractured consciousness

transformed consciousness

3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

Both David Bohm and Fritjof Capra are renown physicists and scientific philosophers who have challenged longstanding empirical notions of objectivity, and related notion of duality in Cartesian and Newtonian thought in the physical sciences. Capra cites other physicists who agree:

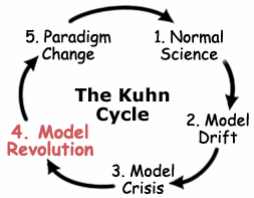
"In the words of Heisenberg, `What we observe is not nature itself, but nature exposed to our method of questioning.* Capra continues, *"John Wheeler...has therefore suggested replacing the word `observer' with `participator'" [Capra, 1982, p. 152-3].

Capra points to one subatomic particle theory to illustrate how Western science constructs reality through a particular subjective approach:

"It implies, ultimately, that the structures and phenomena we observe in nature are nothing but creations of our measuring and categorizing mind. That this is so is one of the fundamental tenets of Eastern philosophy" [p. 306].

3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

Thomas S. Kuhn, scientific historian, author of ***The Structure of Scientific Revolutions*** provocatively spelled out the tendency in scientists – similar to most fellow human beings – to become attached to what is familiar and resist new paradigms. Scientists, instead, prefer to dig more deeply into what are assumed to be known facts and likely predictions in what he calls "normal science":

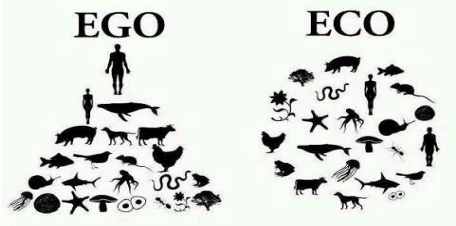


"Closely examined, whether historically or in the contemporary laboratory, that enterprise [normal science] seems an attempt to force nature into the preformed and relatively inflexible box that the paradigm supplies. No part of the aim in normal science is to call forth new forms of phenomena; indeed, those that will not fit the box are often not seen at all. Nor do scientists aim to invent new theories, and they are often intolerant of those invented by others" [Kuhn, 1970, p. 24].

3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

Physicist David Bohm, similar to Capra, distinguishes Western from Eastern perspectives, for example, regarding notions of `measure': "In the very early phases of the development of civilization, man's views were essentially of wholeness rather than of fragmentation" [Bohm, 1980, p. 25]

"In the West, the notion of measure has, from very early times, played a key role in determining the general self-world view and the way of life implicit in such a view...In this regard, measure was not looked on in its modern sense as being primarily some sort of comparison of an object with an external standard or unit. Rather, this latter procedure was regarded as a kind of outward display or appearance of a deeper `inner measure,' which played an essential role in everything. When something went beyond its proper measure, this meant not merely that it was not conforming to some external standard of what was right but, much more, that it was inwardly out of harmony, so that it was bound to lose its integrity and break up into fragment."



3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

"Measurement" is at the core of one of the major flaws of the OPG report which is based, however, upon similarly flawed EIS guidelines. Computer modelling is one of the measurement tools applied to gather evidence and justify the alleged insignificant harm to the natural environment and human health, if the proposed DGR were built.

Capra, in ***THE WEB OF LIFE A New Scientific Understanding of Living Systems***, reminds us that cognition in human beings differs from other living entities:

"The ability to abstract is a key characteristic of human consciousness,... and because of that ability we can and do use mental representations, symbols, and information. However, these are not characteristics of the general process of cognition that is common in all living systems" [Capra, 1996, p. 272]

3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

Capra clarifies the misunderstanding about "computer intelligence," and how human constructed computer programming simply cannot mimic the natural world:

"A computer processes information, which means that it manipulates symbols based on certain rules. The symbols are distinct elements fed into the computer from the outside, and during the information processing there is no change in the structure of the machine. The physical structure of the computer is fixed, determined by its design and construction.

The nervous system of a living organism works very differently...it interacts with its environment by continually modulating its structure, so that at any moment its physical structure is a record of previous structural changes. The nervous system does not process information from the outside world but, on the contrary, brings forth a world in the process of cognition... .

Human decisions are never completely rational but are always colored by emotions, and human thought is always embedded in the bodily sensations and processes that contribute to the full spectrum of cognition.

As computer scientists Terry Winograd and Fernando Flores point out...rational thought filters out most of that cognitive spectrum and, in so doing, creates a "blindness of abstraction" [Capra, 1996, p. 274-5].

3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

To sum up, the fact of `subjectivity,' and the highly constructed methods of gathering and organizing scientific data that inherently fragmented, illustrates a major disconnect with the reality of living organisms within natural environments interwoven with elements of air, water, soil and minerals. In other words: "The web of life is a flexible, ever fluctuating network" [p.302] – still illusive to our full comprehension.

3. DILEMMA OF HUMAN SUBJECTIVITY vis à vis SCIENCE

How can we evaluate what we do not know? To illustrate the fact that the world of nuclear energy is only in its early stages of ecological literacy is evident by the continuing research identified in the pages of the website for the International Commission of Radiological Protection (ICRP) at http://www.icrp.org, where the ICRP declares its own subjectivity:

> "The International System of Radiological Protection has been developed by the ICRP based on (i) the current understanding of the science of radiation exposures and effects and (ii) value judgements. These value judgements take into account social expectations, ethics, and experience gained in application of the system."

The ICRP clearly communicates its `subjectivity,' namely, that its work is influenced by "value judgements." These value judgements impact on the rationale of all practitioners in the nuclear industry.

ICRP web pages, moreover, indicate "Protection of the Environment" is a work-in-progress. Its ongoing studies show that the ICRP is aware of the need for improvement to minimize inevitable harm to living organisms.

4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.1 Limitations of the Precautionary Principle

The EIS guidelines specify that the proponent, namely the OPG/NWMO, must adhere to the `precautionary principle,' as per "A Framework for the Application of Precaution in Science-based Decision Making about Risk, published by the federal Privy Council Office in 2003. One telling sentence reads:

> "The application of precaution is distinctive within science-based risk management and is characterized by three basic tenets: the need for a decision, a risk of serious or irreversible harm and a lack of full scientific certainty."

The origin of this principle, however, identified in the EIS guidelines, is Principle 15[2] of the 1992 Rio Declaration on Environment and Development and Canadian government's framework for applying precaution in decision-making processes.

The Precautionary Principle's inclusion in the EIS guidelines indicates awareness that the proposed burial of radioactive waste in a DGR does carry "a risk of serious or irreversible harm," as well as acknowledgment of "a lack of scientific certainty."

How closely the proponent adhered to the principle will be addressed by other interveners at the JRP hearing, given the number of criticisms about the lack of rigour in the OPG report, including concerns expressed from other federal and provincial ministries.

4. CRITIQUE OF SELECTED & RELATED DOCUMENTS

4.1 Limitations of the Precautionary Principle

The good intention of the Precautionary Principle can be undone by how it is exploited, according to Dr. Joel Tickner, Director, Lowell Center for Sustainable Production, at the University of Massachusetts, and author of ***Dimensions of Sustainable Development***

Tickner writes that this principle "increasingly is being recognized as a central principle of sustainability" for three very legitimate reasons: (1) science is unable fully to address complex causes of environmental degradation; (2) government is responsible to protect citizens in the face of uncertain harm, and (3) values and judgment are an integral part of the decision-making process"[http://www.eolss.net/Sample-Chapters/C13/E1-46B-16.pdf]. Similar to Capra, Tickner identifies limitations of both scientific and regulatory processes:

> "Regulatory programs often demand demonstration of statistical significance in experimental and observational research. However, even though an effect is not statistically significant, it may be of public or ecosystem health significance. Statistical power is directly influenced by sample variance (natural variability in the sample and measurement error) and magnitude of effect. Because ecological systems are complex in structure and function, they are subject to intrinsic variability and confounding from multiple stressors, pathways for effect, and causative agents."

4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.2 Controversy about Evaluating Low Level Radiation

How is it humanly possible to safeguard living organisms from the inevitable leaks of ionizing radiation, with so many uncertainties from inadequate measurement tools to yet unknown, and impossible to predict, impacts from climate change through the years?

The Canadian Nuclear Safety Commission (CNSC) website shows an online article dated December 16, 2009, about a `Linear No-Threshold (LNT)' model used internationally, "to keep radiation exposure **A**s **L**ow **A**s **R**easonably **P**ossible (called the ALARA principle). The CNSC states: "If new research revealed another model that provided the same degree of safety as the LNT and that was supported by the international radiation protection community, then the CNSC would consider adopting such a model."

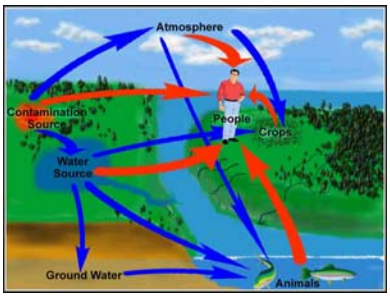
The International Atomic Energy Agency (IAEA), in its publication ***Radiation, People and the Environment*** (2004) writes: "For many years, the internationally accepted solution has been to assume that the relationship [dose-risk] is linear for low doses, all the way down to zero... [the LNT hypothesis] that any radiation dose has a detrimental effect, however small...However, UNSCEAR [United Nations Scientific Committee on the Effects of Atomic Radiation] also accepted that there are ***uncertainties*** [my bold italics] and stated that "a strictly linear dose response relationship should not be expected in all circumstances."

4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.2 Controversy about Evaluating Low Level Radiation

Dr. Ian Fairlie, an independent consultant on radioactivity in the environment, wrote in December 2012: "Currently, much debate exists about validity of the linear no-threshold theory (LNT) for radiation risks." See his informative website: http://www.ianfairlie.org

The ICRP, meanwhile, in recent years is beginning to study the natural environment, as studies-in-progress indicate on its website. In other words, not enough scientific inquiry has yet been done to debate effects upon nonhuman species and interrelated ecosystems.



4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.2 Controversy about Evaluating Low Level Radiation

Capra, in ***The Web of Life***, explains the resistance to, and obfuscation of, nonlinear equations through the past century. His mapping of this history illustrates Kuhn's theory about the reluctance of the majority of scientists to shift into accepting, and exploring, newer theories that can bring forth much more enlightenment pertinent to our planetary circumstances today: Capra writes:

> "The decisive change over the last three decades has been to recognize that nature, as [Ian] Stewart puts it, is "relentlessly nonlinear." Nonlinear phenomena dominate much more of the inanimate world than we had thought, and they are an essential aspect of the network patterns of living systems. Dynamical systems theory is the first mathematics that enables scientists to deal with the full complexity of these nonlinear phenomena."

Capra mentions a further characteristic of nonlinear equations. It raises the question about whether we humans can assume that the web of planetary life ever can be measured to accommodate and justify our intrusive practices:

> "Another important property of nonlinear equations that has been disturbing to scientists is that exact prediction is often impossible, even though the equations may be strictly deterministic. We shall see that this striking feature of nonlinearity has brought about an important shift of emphasis from quantitative to qualitative" [Capra, 1996, p. 123].

4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.3 Environmental Assessment Boundaries

What surprised the intervener was to find out that the environmental assessment boundaries were chosen not by OPG/NWMO but identified in the EIS guidelines. The areas are Site Study Area called DGR inside orange boundaries, Local Study Area (LSA) within red boundaries, and Regional Study Area (RSA) within purple boundaries on map

The upcoming series of maps illustrate a sequential mapping of watersheds that are not considered in the OPG DGR report, yet which point out the lack of comprehension in the intervener's opinion, about how the natural world – and all life-threatening affects from intrusive activities upon it, such as DGR burial of radioactive waste is ignored – because planetary life functions through interrelatedness across ecosystems and bioregions, most especially through the planet's interwoven hydrological systems.

Map of EA Study Areas

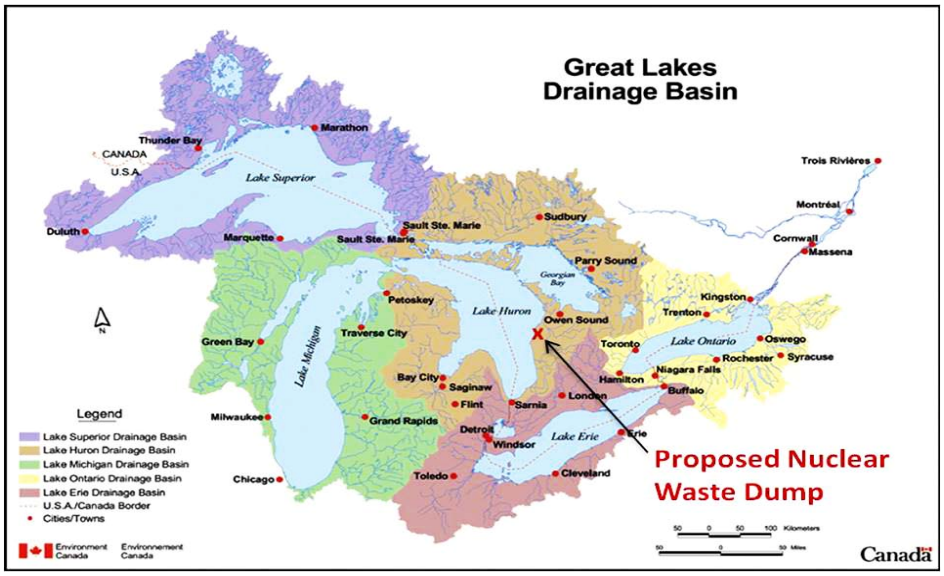
4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.3 Environmental Assessment Boundaries

4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.3 Environmental Assessment Boundaries

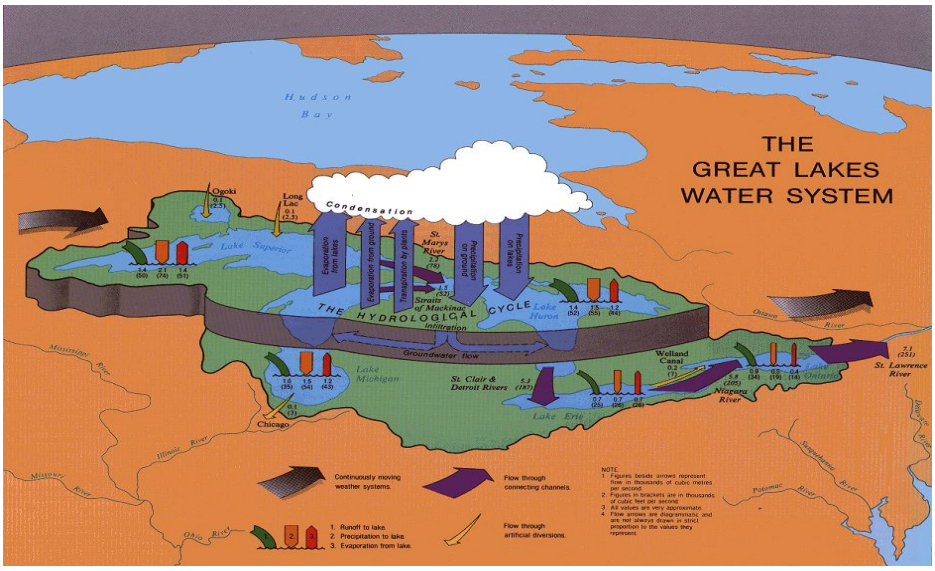
The Great Lakes Drainage Basin is what ought to be the acknowledged, ecologically.



4. Critique of Selected EIS & Related Documents

4.3 Environmental Assessment Boundaries

The hydrological cycle needs to be understand much better by all planetary citizens.



4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.4 Effects Prediction, Mitigation Measures, Significance of Residual Effects

In her research, the intervener read the EIS guidelines following a review of passages from the OPG/NWMO responses to the EIS, to discover the direction given to the proponent:

> "In assessing significance against these criteria, the EIS must, where possible, employ relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous agents in the environment. If the level of an adverse environmental effect is less than the standard, guideline, or objective, it may be not significant."

The intervener suggests, the OPG/NWMO responses to the EIS guidelines are less than satisfactory – the specifics of which will be addressed by other JRP hearing interveners. For example, in section ES.7 ASSESSMENT OF EFFECTS of the OPG Environmental Impact Statement, dated March 2011, the OPG shows Table ES-1: Summary of Residual Adverse Effects by Environmental Component, to conclude in most sub-sections "No residual adverse effects," and overall, nothing of significant value to stop the proposed DGR project from moving forward.

Regardless, given the bigger picture of uncertainties, and ongoing quest for improvements in determining better informed and more accurate acceptable international standards, pursued by the ICRP and IAEA, obviously the science is not yet ready to provide assurance that the DGR burial of nuclear waste at any level, including low level radioactive waste should be pursued, and licensed, in the near or foreseeable future.

4. CRITIQUE OF SELECTED EIS & RELATED DOCUMENTS

4.5 Cumulative Effects

The intervener here cites the OPG, in its submission to the Environmental Assessment in which the OPG concludes, in section 10.0 CUMULATIVE EFFECTS that: "No adverse cumulative effects were identified," in regard to which further details are provided.

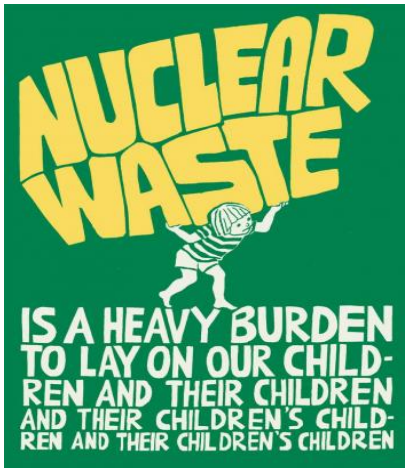
But, again, what are the prior regulations and standards by which the OPG and NWMO are taking their direction? For "cumulative effects" I here refer the reference guide of the Canadian Environmental Assessment Agency on its website, under the heading: "The Concept of Cumulative Environmental Effects." The following are a few excerpts:

"Ecosystems cannot always cope with the combined effects of human activities without fundamental functional or structural changes."

Under "Framework for Addressing Cumulative Environmental Effects in Federal Environmental Assessments," the directions are tightly constructed and formulated in accordance with "appropriate geographic and temporal boundaries." In "Determining Significance" the advisory is: "Consider existing environmental standards, guidelines and objectives." A cautionary note does not support defining larger boundaries for which "only a superficial assessment may be possible and uncertainty will increase."

How then do we come to terms with acceptance, rather than denial, about limitations to human knowledge, in order to recognize that we are not ready to decide on DGR burial of one of the most lethal substances on the face of this planet, with unpredictable risks. given the unknown impacts of current and future climate change through time?

5. SUMMARY



Please note, further details are available in fuller written submission available as a public record on CEAA website.