

REPURPOSING PICKERING – AN INNOVATIVE APPROACH TO IDENTIFY NEW USES AND REUSES OF A NUCLEAR SITE

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Abstract

As part of planning for the Pickering end of commercial operations and decommissioning, Ontario Power Generation (OPG) has begun to explore the possibilities for new uses and reuses of the Pickering Nuclear site. The aim of OPG's *Repurposing Pickering* initiative is to identify and eventually implement land uses that take advantage of existing assets – without interfering with decommissioning or limiting the site's long-term potential.

By developing and applying an approach that is inclusive, systematic and traceable, more than 600 ideas were received, consolidated and assessed in terms of suitability for implementation during the decommissioning period. As a result, 24 land use options – pertaining to four different land use categories – are recommended for further study on specific portions of the site. The majority of the land uses suggested was received through various public and stakeholder engagement activities.

The assessment results correlate strongly with the input received directly from the public, whose ideas primarily related to the same four categories as above: power (33%) and recreational (31%) land uses, followed by institutional (19%) and industrial (14%). The remaining three categories – office, residential and retail – received negligible support; with regards to residential, about the same number of people explicitly said that they are against as those who said that they are for.

Since developing a repurposing vision helps to shed light on a site's assets, the probability that these are recognized and can be leveraged will likely increase. For this reason, creating a repurposing plan can be a valuable complement to planning for shut down and decommissioning at any site – large or small, urban or rural.

1. Introduction

Within the Greater Toronto Area, on the shore of Lake Ontario, is one of the world's largest nuclear generating stations: OPG's Pickering Nuclear station. The first of its total of eight CANDU reactors was brought into service in 1971; the last is scheduled to be shut down in 2024.

Given the Pickering Nuclear site's attractive location and size – 500 acres of land in total – it constitutes a significant asset (see Figure 1). As such, as part of planning for the Pickering end of commercial operations and decommissioning, OPG has begun to explore possibilities for new uses and reuses on the site. OPG's goal is that the site will continue to benefit OPG, surrounding communities and the Province of Ontario both during the decommissioning period and beyond.

To facilitate achieving that goal, OPG formulated a set of objectives for *Repurposing Pickering*. These relate to maximizing: (1) economic value for OPG and its shareholder (the Province of Ontario); (2) likelihood of retaining the power generation franchise; (3) generation of employment opportunities; (4) compatibility with the communities' visions and plans; and (5) flexibility for future uses.

Through *Repurposing Pickering*, OPG aims to identify and implement land uses that take advantage of existing assets – without interfering with decommissioning or preventing the site's long-term potential from being realized. And as a starting point for what will take many decades to complete, OPG has conducted an interdisciplinary study to determine potential new uses and reuses of the site [1]¹; the aim of that first study was to explore future possibilities broadly – and then narrow down and recommend a manageable number of land use options for further study.

In this paper, the assessment approach developed as part of the *Repurposing Pickering* study is first outlined generically, followed by an overview of how it was applied for the Pickering Nuclear site specifically. Highlights of the assessment results are also provided.



Figure 1 Aerial view of the Pickering Nuclear site.

¹ The report and other information on the study are available at www.opg.com/repurposingpickering.

2. Approach

When embarking on repurposing a large site, basic questions that need to be explored include: What type of new uses and reuses may be beneficial? Where would they be located? And When could they be implemented? As these questions are best answered in concert, an integrated approach was developed as part of the *Repurposing Pickering* study.

A key requirement was that the approach be conducive for public and stakeholder engagement, since OPG wanted to ensure that anyone who wanted to would be able to contribute in a direct and tangible manner. The approach also needed to be systematic and traceable, to facilitate communication of the study with interested parties – both current and future. The resulting, step-wise process that was developed is shown in Figure 2. An overview of the purpose and main tasks associated with each of the five steps is given in the subsections that follow. In Figure 3, the overall traceability of the ideas captured is illustrated and exemplified.

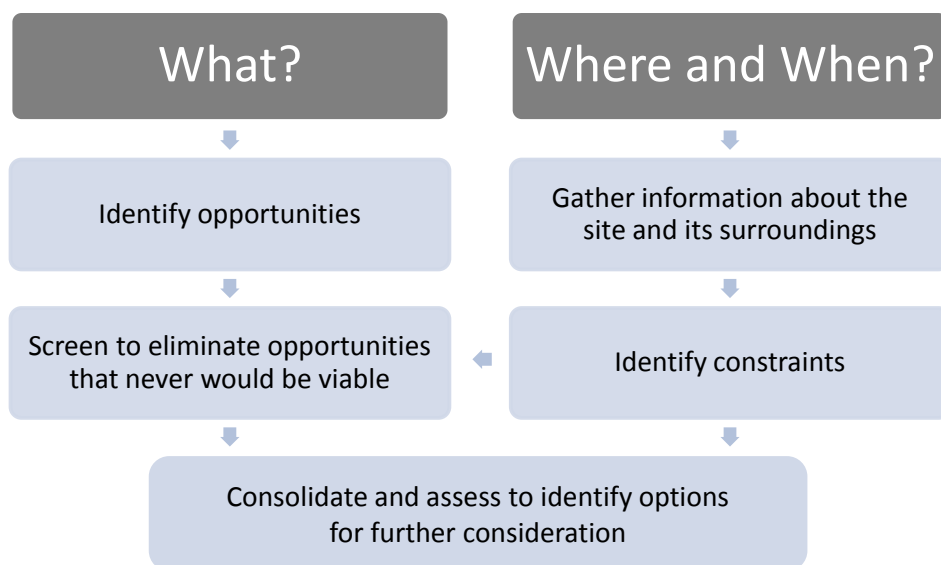


Figure 2 Integrated, step-wise process to determine land use options for further consideration.

2.1 Identifying opportunities

The purpose of this step is to generate a list of opportunities that eventually will feed into the assessment. In this context, an opportunity means any idea or suggestion for a new use or reuse on the site. Opportunities do not need to be permanent and do not need to use all of the available area on the site; that is, they may be temporary and/or suggested for only a portion of the site, hence leaving the balance available for other uses.

To ensure that a wide range of opportunities is captured, it is important that input be solicited from people with varying interests and knowledge about the site and its surroundings. Desktop studies can be used as a complement to further make sure that the list is comprehensive.

To make it conducive for brainstorming, this step purposely takes place prior to formulating any constraints; that is, at the onset, ‘everything is on the table.’ Specific tasks in this step include:

- ✓ Select and plan the activities that are appropriate for receiving input for the site at hand. This includes identifying key stakeholders and the means for receiving their input.
- ✓ Conduct the planned activities and document the input received.
- ✓ Review the input and create a list of all suggested new uses and reuses (that is, the list of opportunities should only include ideas that specifically pertain to what to implement).

2.2 Gathering information about the site and its surroundings

To ensure that the assessment of future uses is done in a site-specific context, information on a broad range of aspects needs to be gathered. The purpose of this is to identify considerations that will be key input to subsequent steps. Such considerations include both existing assets that can be leveraged and features that may pose constraints.

This step can be performed in parallel with identifying opportunities. It can be done through desktop studies or by soliciting information from stakeholders – or a combination thereof. The specific aspects that are relevant to study are site-dependent, but the key is to encompass both the site itself and its surroundings. As a minimum, the following tasks are done in this step:

- ✓ Study the current land uses on the site and any existing plans associated with their future development; in particular, review the plans for nuclear decommissioning.
- ✓ Capture information about adjacent land areas and bodies of water.
- ✓ Identify any regulatory requirements that may impact the potential for implementing certain uses, as well as any relevant government policies or plans.

2.3 Identifying constraints

Next, the information that has been gathered will be integrated in a manner that conveys the main constraints, both in terms of where future uses may be implemented and when. The purpose of this is to get a clearer understanding of the potential for implementing new uses and reuses – both spatially and temporally. The following tasks are performed in this step:

- ✓ Divide the study area into planning zones, which each encompasses an area with common features or constraints (and, as such, is likely to become available for repurposing around the same time and for similar types of land uses).
- ✓ Specify the land uses that are assumed cannot be changed – both on and adjacent to the site – and the time period for when these are ‘fixed.’ This includes decommissioning and associated activities, such as transportation of equipment and materials.
- ✓ Using the classification scheme in Table 1, determine the repurposing potential over time for each of the planning zones.

Table 1 Classification scheme – repurposing potential of land areas.

Repurposing Potential – Classification	Description
No	Implementation of reuses or new uses is not deemed possible due to the very high level of constraints imposed by the activities within or adjacent to the planning zone.
Low	Certain types of complementary uses would be possible to implement, although significant constraints are anticipated. Changes on a smaller scale may be particularly conducive.
Medium	New uses may be possible to implement also on a larger scale, subject to applicable constraints and uncertainties.
High	Complete change in use within all or most of the zone may be possible.

2.4 Screening opportunities

The screening step provides a mechanism for removing opportunities from further consideration early on in the process. The purpose of this is to enable the identification of opportunities to be done without any restrictions, while at the same time ensuring that there is a ‘filter’ by which any suggestions that never would be viable can be removed prior to performing the assessment. This ensures that all input is treated equally and systematically – yet, avoids spending unnecessary time in the event that ideas are put forth that never would be viable and, hence, would not be meaningful to consider any further. The screening is intended to be a quick and simple process step, so if there is uncertainty whether or not an opportunity would be screened out, it should pass the screening.

The specific tasks in this step are:

- ✓ State the specific reason for the screening and define associated screening criteria.
- ✓ Screen the list of opportunities and document the rationale for any that were screened out.
- ✓ If applicable, revise the list of opportunities to exclude those that were screened out.

2.5 Consolidating and assessing to identify options for further study

Through a series of activities, the list of screened opportunities is, in this step, transformed and qualitatively assessed against identified constraints and other knowledge gained in the preceding steps. The output of this step is a set of defined land use options recommended for further study on specific planning zones. Unlike in the screening step, it is important to provide rationale in all cases (that is, whether the land uses assessed are recommended for further study or not).

The specific tasks in the consolidation and assessment step are:

- ✓ Specify the time period for the assessment (that is, the years during which the suggested land uses would be in place).
- ✓ Select and define a set of conducive land use categories. The categories selected will depend on the site's location, as well as on the list of opportunities, but the aim is to ensure that all identified opportunities can be assigned to a category.
- ✓ Using the classification scheme in Table 2, assess the potential for implementing each of the land use categories on the site as a whole and document the rationale.
- ✓ For the recommended categories, consolidate and sort the associated opportunities into specific land use options and define those options. The selection of options will depend on the site's features and the opportunities within the 'green' categories, but the aim is to ensure that the options will enable differentiation in terms of suitability for the site.
- ✓ Using the classification scheme in Table 2, assess the potential for implementing each of the land use options on each of the planning zones and document the rationale.
- ✓ Summarize the options recommended for further study according to planning zone.

Table 2 Classification scheme – implementation potential of land uses.

Implementation Potential – Classification	Description
	Recommended for further study Land use deemed to have potential to create benefits, and no significant constraints or other challenges for implementation have been identified.
	Not possible to implement Significant constraints have been identified that would prevent implementation of the land use during the assessment period, such as: – Regulatory requirements – Technical and other physical constraints
	May be possible to implement but not recommended for further study Factors have been identified that would make implementation of the land use challenging, such as: – Market demand and/or supply issues – Superior locations exist

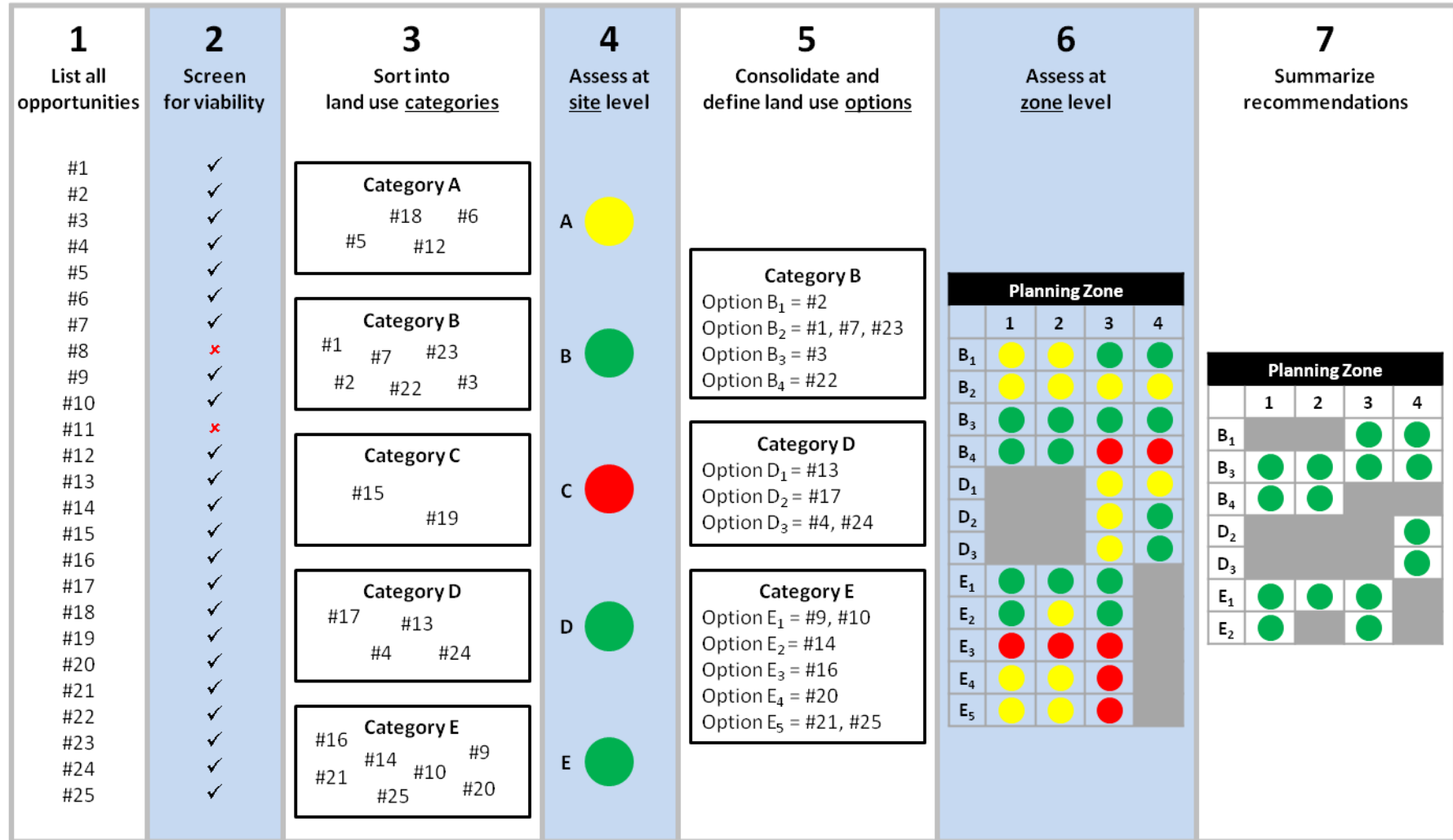


Figure 3 Traceability of input received – exemplified by narrowing down 25 opportunities, via 5 categories, to 7 options over 4 zones.

Note: Odd-numbered columns represent identification or resorting of opportunities; even-numbered represent process-steps during which the input is narrowed down – either against screening criteria or by assessing implementation potential. If conducive, a category can be deemed not applicable as a whole on certain zone(s); in the example above, this was done for Categories D and E, on Planning Zones 1/2 and 4 respectively (as such, those are greyed out in the sixth column).

3. Application of approach and results for the Pickering Nuclear site

In this section, highlights are provided of what the approach above entailed when applied specifically to the Pickering Nuclear site. Further information on the *Repurposing Pickering* study is provided in [1], which is available at www.opg.com/repurposingpickering.

3.1 Pickering Nuclear site – Key considerations and constraints

Apart from nuclear power generation, the Pickering Nuclear site hosts several complementary land uses – ranging from reactor simulator training, landfills (for conventional waste from station construction) and storage of used fuel – to public beaches, parks and sports fields. As such, the constraints and potential for implementing new uses and reuses vary greatly.

As shown in Figure 4, applicable OPG-owned land areas were divided into eight planning zones. Of these, two zones comprise land that is licensed to the City of Pickering for public recreational use (Zones 1 and 2). One zone primarily consists of parking lots (Zone 4) and one zone is an undeveloped woodlot (Zone 5). All nuclear activities, including transfer of used fuel from the station to the Pickering Waste Management Facility, are conducted within Zones 7 and 8.



Figure 4 The Pickering Nuclear site and associated planning zones.

Once commercial operations have ended, the Pickering Nuclear station will be placed in a safe storage state. Preparation for safe storage will take approximately three years to complete. Around 30 years after shut down, dismantling, demolition and site restoration will begin. The total decommissioning period of the station is therefore in the range of 40 years. While the station is in safe storage, used fuel will continue to be stored on the site; initially, also inside the station's irradiated fuel bays, but over time, all used fuel will have been transferred into dry storage containers for interim storage at the Pickering Waste Management Facility (located partly in Zone 7 and partly in Zone 8).

Given the above, it is deemed that there is no or low repurposing potential on several of the zones during the first three years, as well during dismantling, demolition and site restoration. Additional 'fixed' uses during the decommissioning period include continued public use of the recreational areas and simulator training for Darlington staff. It is also assumed that the large landfill on Zone 6 will remain in place. When taken together, the various constraints result in the repurposing potential over time being as illustrated in Figure 5.

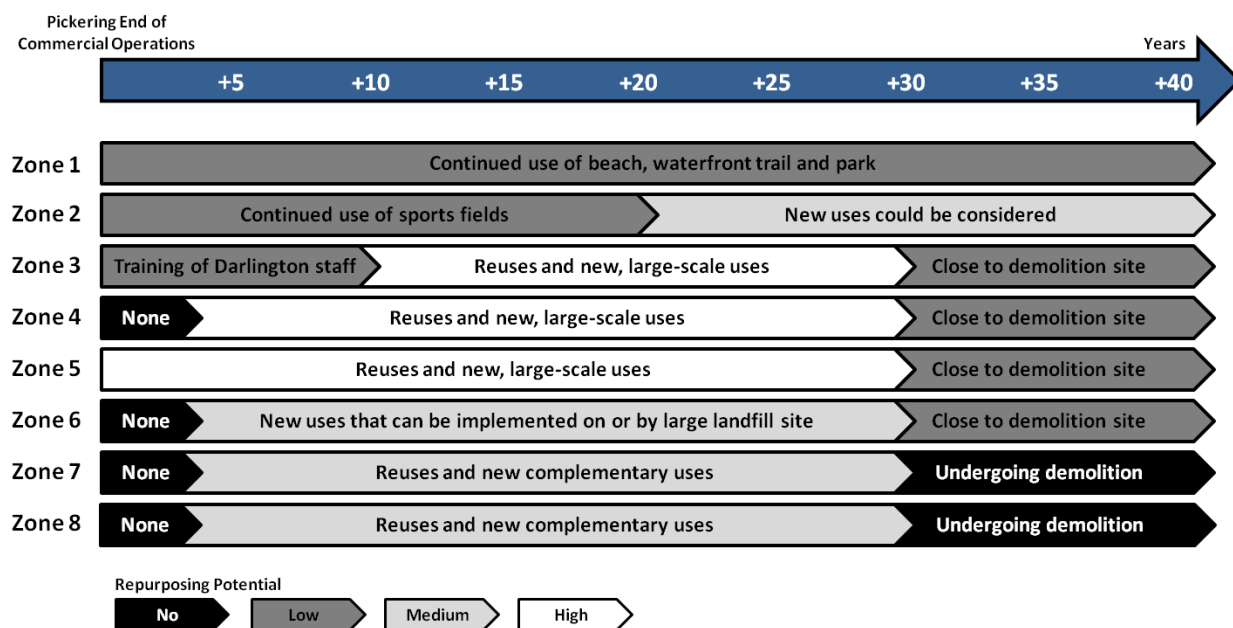


Figure 5 Pickering site's repurposing potential over time during the decommissioning period.

As indicated above, two main windows of opportunity emerge for any major repurposing initiatives during the decommissioning period (that is, opportunities with potential for repurposing of uses that span multiple decades and/or multiple planning zones):

- Zones 3, 4 and 5 are all anticipated to become available for complete change in use during the decommissioning period.
- Zones 6, 7 and 8 are, throughout the decommissioning period, all expected to be used for storage of waste. However, given the size of these zones, it is anticipated that all three would be able to host one or more repurposed uses – subject to applicable constraints.

Given its urban location, it is recognized that repurposing of the Pickering Nuclear site will be intertwined with developments in the site's surroundings – ranging from the City of Pickering's and Region of Durham's visions and policies to developments in the Greater Toronto Area as a whole. Because of that, much of the efforts during the information gathering step was focused on learning about factors external to the site itself. Examples of key factors include:

- As part of a major metropolitan area, a large and/or specialized workforce is nearby.
- Existing infrastructure and proximity to major transportation routes mean that the site is accessible by multiple modes (road, rail and water), as well as accessible for both large numbers of people and heavy and large loads.
- Municipal and regional policies encourage economic development and express a goal to advance the region as the “energy capital of Ontario.”
- The site is located by important bodies of water (including provincially significant wetlands) and wildlife habitat.

3.2 Identification and screening of opportunities

A cornerstone of the *Repurposing Pickering* study was to engage and seek input from the public and a wide range of stakeholders. To achieve this, a range of activities took place, including: (1) a public consultation series in the local communities (pop up information booths and an open house); (2) forming a Technical Advisory Committee and engaging the existing Pickering Community Advisory Council; (3) hosting employee brainstorming sessions; and (4) launching external and OPG-internal websites and encouraging visitors to submit ideas via email (to an address created for that purpose). Opportunities were also generated by the consultant team that OPG had engaged for this study. In all, this resulted in a list of 630 opportunities, of which more than 500 were received from the public and stakeholders. In addition, around 150 local students created visual illustrations of their ideas for the future site through youth engagement workshops.

For the screening, it was deemed that only any opportunities that obviously would violate judicial or natural laws would be removed. The screening criteria were therefore formulated as: (1) *Is it legal?*; (2) *Is it technically possible?*; (3) *Can it be implemented on 500 acres of land or less?*; and (4) *Are the geological and hydrological conditions on the site conducive?* Although some of the opportunities may not be possible to implement in practice, none of them were such that an answer was an obvious ‘no.’ As such, all 630 opportunities passed the screening.

3.3 Land use categories and options – Assessment and results

Due to the site's urban location, the land use categories chosen for the assessment were based on standard real estate classes, complemented by a category for power-related uses. Given the deferred dismantling strategy, the assessment was focused on the land uses that would be compatible with the activities that will take place during the decommissioning period. Of seven categories altogether – the following four received a ‘green light’ in the assessment at the category/site level: power, industrial, institutional and recreational. Among these, a total of 24 land use options were subsequently recommended for further study, as shown in Table 3.

Table 3 Summary of options recommended for further study for *Repurposing Pickering*.

	Planning Zone							
	1	2	3	4	5	6	7	8
Power								
Combined Heat and Power				●			●	●
Energy Storage				●			●	●
Energy Testing and Innovation				●			●	●
Natural Gas				●			●	●
Nuclear Fission (Small Scale)							●	●
Power Conversion and/or Distribution				●			●	●
Reactive Power Compensation				●			●	●
Solar			●	●	●	●	●	●
Industrial								
Cooling							●	●
Data Centre			●	●			●	●
Film Studios			●	●	●	●	●	●
Food Production			●	●	●	●		
Manufacturing			●	●	●		●	●
Nuclear Materials Handling				●			●	●
Other Business Services			●	●	●		●	●
Outdoor Storage			●	●	●	●	●	●
Institutional								
Higher Education and/or R&D	●	●	●	●	●	●	●	●
Other Community Services	●	●	●					
Public Information Centre and/or Museum	●	●	●	●				
Public Tours	●	●	●	●	●	●	●	●
Recreational								
Community Activities	●	●	●		●			
Parkland	●	●	●		●	●		
Sports Stadium (Small Scale)		●	●					
Waterfront Recreation	●							

The assessment results correlate strongly with the input received directly from the public, whose ideas primarily related to power (33%) and recreational (31%) land uses, followed by institutional (19%) and industrial (14%). The remaining three categories – office, residential and retail – received negligible support; with regards to residential, about the same number of people explicitly said that they are against as those who said that they are for that land use.

4. Conclusion

Given the timescale and complexities associated with decommissioning a large nuclear station, redevelopment of available land areas is undoubtedly associated with great uncertainties. Nevertheless, by making the vision to repurpose the site explicit, light is shed on the site's assets, which in turn ought to increase probability that these can be leveraged. For this reason, creating a plan for repurposing can be a valuable complement to planning for end of commercial operations and decommissioning at any site. Regarding the specific approach to repurposing planning developed and applied for the Pickering Nuclear site, the following is concluded:

- As a way to engage the public and stakeholders early in the process, the approach was proven to be very successful; hundreds of people have had direct and tangible impact on the study, and the feedback received from participants has been predominantly positive.
- Whether opportunities are solicited from many people or just a few, the same approach can be applied. As well, there is a high degree of flexibility in terms of how the input is received and recorded (face-to-face, electronic media, comment cards, etc.)
- A downside with there being no restrictions on the input received is the imbalance it creates in terms of level of detail of opportunities; to exemplify, ideas put forth for the Pickering Nuclear site ranged from “Power plant (for peaks)” to specific details on both plant design and location. Although resolving this imbalance is part of the consolidation and assessment step, it does add to the efforts. As well, it risks creating a need for vaguely defined options (such as “Other community services” in Table 3).
- The systematic and traceable nature facilitates communication of the assessment results with all interested parties – both current and future; that is, by making it possible to follow every idea put forth through the process, there is transparency in why certain land use options were recommended for further study – and other suggestions were not.
- In the event that basic prerequisites will change over time, the step-wise process and visual representations make it relatively easy to revisit and revise in the future.
- The options recommended for further study subsequently require much more scrutiny, both individually and in terms of compatibility and synergy with each other. The output of the approach is therefore suitable as direct input to studies that determine aspects such as economic and technical feasibility, as well as the creation of implementation plans.

5. References

- [1] OPG, “Repurposing Pickering – Exploring the possibilities for new uses and reuses on the Pickering Nuclear site” (www.opg.com/repurposingpickering), December 11, 2015.