NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Funding Canada's Plan for the Safe, Long-Term Management of Used Nuclear Fuel

In 2007, the Government of Canada selected Adaptive Phased Management (APM) as Canada's plan for the safe, long-term management of its used nuclear fuel. APM emerged from a three-year dialogue with Canadians, and reflects their preferences and priorities. In these conversations, citizens shared a strong sense of responsibility. They made clear that our generation has an ethical responsibility to put in place a long-term management approach for the used nuclear fuel we have produced and not leave it as a legacy for future generations.

The planning, development and implementation of the APM plan is funded by the major owners of used nuclear fuel in Canada: Ontario Power Generation, NB Power, Hydro-Québec and Atomic Energy of Canada Limited. The *Nuclear Fuel Waste Act* (*NFWA*) requires each of these four companies to establish independently managed trust funds and make annual deposits to ensure the money to fund this project will be available when needed. Effectively, this means it is consumers benefiting from the electricity who will, over time, fund the long-term management of the waste that is generated.

There is a strong legislative framework in place to ensure funding will be available when needed to implement the APM Project:

- The *NFWA* (2002) addresses funding of the APM Project, and assigns roles and responsibilities.
- Waste owners must fund the APM Project through annual deposits to trust funds at levels set by the NWMO.
- The Minister of Natural Resources Canada approved the APM funding formula in 2009.
- Waste owners are also required under the *Nuclear Safety and Control Act* to provide to the Canadian Nuclear Safety Commission financial guarantees dedicated to nuclear waste management and decommissioning.

Trust funds are in place with regular contributions being made to meet project implementation costs:

- Trust fund balances at end of 2015 are $3.7 billion.
- Waste owners are required to continue annual contributions to trust funds, ensuring the funds necessary for the complete construction costs of the facility will be available by the time construction begins.

How much is the APM Project expected to cost?

The eventual cost of the APM Project is impacted by many factors, including the volume of used nuclear fuel to be managed. For the purpose of the last full update, which was completed in 2016, two used nuclear fuel inventory scenarios were analyzed: 3.6 million and 7.2 million used fuel bundles. These two scenarios form the baselines, from which cost estimates for an inventory between these two points can be derived.

Based on the latest projection, at the end of the planned operation of Canada's existing nuclear reactors, the number of used nuclear fuel bundles could total up to about 5.2 million. The total cost of the APM Project is estimated to be $22.8 billion (2015 $), or taking into account the time value of money, present value of $8.2 billion (January 1, 2016, present value).

This estimate covers the lifecycle cost of the APM Project from the start of the site selection process in 2010. This new estimate takes into account the latest conceptual designs for barriers and facilities that are optimized for the safe, long-term management of CANDU fuel.

Average cost per KWh required to fund the APM Project

The cost of the long-term management of used nuclear fuel is a relatively small portion of electricity costs.

If a lifecycle volume of 5.2 million bundles is assumed, a unit rate of approximately 0.1 cent per KWh would be required to fund the estimated total lifecycle cost of $8.2 billion (2016 present value).

How is the APM Project funded?

The *NFWA* specifically addresses the future financial obligations for managing used fuel over the long term. The legislation requires that each waste owner establish trust funds to cover costs the APM Project will incur once a construction licence is issued. Annual deposits by each waste owner to the trust funds are calculated according to a funding formula.

In the years before a construction licence is obtained, the NWMO's operating cost is provided by the waste owner organizations. Through an annual business planning process with the NWMO's Board of Directors, waste owner organizations provide annual funding based on an agreed cost-sharing formula for these pre-construction costs.

How the funding formula works

The NWMO has the responsibility for maintaining the funding formula. The Minister of Natural Resources Canada approved the formula in April 2009.

Each waste owner's deposit is calculated based on the amount of fuel bundles it has produced to date. It is made up of amounts to cover estimated fixed costs for the NWMO to construct and operate a deep geological repository, as well as variable costs associated with managing each fuel bundle.

The formula assumes a reasonable rate of return, which is consistent with rates realized by each waste owner.

What will be the long-term cost of managing the used nuclear fuel bundles that have been produced in Canada to date?

As of June 30, 2015, just under 2.6 million used nuclear fuel bundles have been produced as a result of more than half a century of nuclear power generation.

Approximately $6.5 billion in 2016 present value is required to fund the costs to select a site, design, construct, operate, and monitor the repository, and to transport the 2.6 million used fuel bundles produced in Canada so far.

Approximately $3.8 billion of this will be needed to cover costs of implementing APM after a construction licence is received. In accordance with the *NFWA*, this portion of the total cost is to be funded out of the *NFWA* trust funds established by the waste owners.

How much funding is already in place?

In accordance with the *NFWA*, waste owners have been making annual deposits into trust funds since 2002. As of the end of 2015, the cumulative balance of the trust funds is $3.7 billion.

With a trust fund balance of $3.7 billion as of the end of 2015, the cost of implementing APM from the start of the construction phase is approximately 97 per cent funded.

Under the funding formula, annual trust fund contributions will continue until the cost of implementing APM is fully funded for all fuel bundles produced.

Waste owner trust fund contributions in 2016

In 2016, the four waste owners are required to make a total trust fund deposit of $215 million. This deposit represents the 2016 contribution toward the cost of the long-term management of the 2.6 million fuel bundles produced up to June 30, 2015, as specified in the APM funding formula.

The trust fund balances as of the end of 2015 and the 2016 deposits required are set out in the table below.

	Trust Fund Balances as at December 2015 ($ million)	2016 Deposits to Trust Funds Required by Waste Owners* ($ million)
Owner	**December 2015**	**2016**
Ontario Power Generation	3,412	200
Hydro-Québec	131	5
NB Power	138	10
Atomic Energy of Canada Limited	48	1
Total	**3,729**	**215**

* Annual trust fund deposits are required within 30 days of the submission of the Annual Report.

How long will the project take to implement?

Timelines assumed within the cost estimate are not deadlines or targets. They are simply reference assumptions to support planning. The NWMO has committed to take the time needed to complete the project properly, and actual timelines may vary from these assumptions.

For the purpose of the latest cost estimate update, it is assumed that the NWMO will be in a position to identify a preferred site by 2023. After that, detailed site characterization and licensing activities could take about eight years. Construction is expected to take about 10 years. In that scenario, it is assumed that operations could begin between 2040 and 2045.

It is assumed that operations will last for around 40 years, depending on the volume of used fuel to be managed. It is also assumed that once monitoring is complete, there will be decades of extended monitoring – the NWMO has assumed 70 years for planning purposes.

How can I stay up-to-date on long-term funding provisions for the APM Project?

You can follow the growth in trust funds over time. As required by the *NFWA*, the NWMO makes public the audited financial statements of the trust funds when they are provided by the financial institutions annually. They are posted at www.nwmo.ca/trustfunds. In addition, in each Annual Report, the NWMO is required under the *NFWA* to provide a range of financial information. NWMO Annual Reports are posted online at www.nwmo.ca.

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