

**nwmo**

NUCLEAR WASTE  
MANAGEMENT  
ORGANIZATION

SOCIÉTÉ DE GESTION  
DES DÉCHETS  
NUCLÉAIRES



# Financial Surety

Presented by: Michael Hung, Chief Financial Officer  
NWMO  
May 2014

# Strategic Objective

- Ensure sufficient funds are available to pay for the safe, long-term management of Canada's used nuclear fuel.



# CNSC Financial Guarantee

## Regulatory Guide, G-206

- 2014 guarantees = \$16.9 billion
- Present value of decommissioning and permanently managing all nuclear waste produced to date
- \$14.8 billion exists in segregated funds with the remainder covered by provincial guarantee.



# 2014 CNSC Financial Guarantee

NFWA Trust Funds \$ 2.9 B



Other Segregated Funds \$11.9 B



Provincial Guarantees \$ 2.1 B



CNSC Financial Guarantee \$16.9 B



# Segregated Funds

## Ontario Nuclear Funds Agreement (ONFA)

- ❑ Risk Sharing Agreement between the Province of Ontario and OPG including specific direction on establishment of segregated funds
- ❑ ONFA funds covers the following costs:
  - ❖ Long term management of used fuel
  - ❖ Long term management of low & intermediate level waste
  - ❖ Nuclear facility decommissioning
- ❑ ONFA fund balance as of January 2014 = \$ 14.1 B



# Nuclear Fuel Waste Act (NFWA)

- The Nuclear Fuel Waste Act provides the legislative framework for the program funding, and sets statutory roles and responsibilities for the NWMO and the owners of the used nuclear fuel.



Natural Resources  
Canada

Ressources naturelles  
Canada

Canada

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# Who pays for the APM program?



- ◆ Operate 12 power reactors in Ontario
- ◆ Owner of 8 power reactors operated by Bruce Power and owner of used fuel produced



- ◆ Owner of 1 power reactor Quebec



**Énergie NB Power**

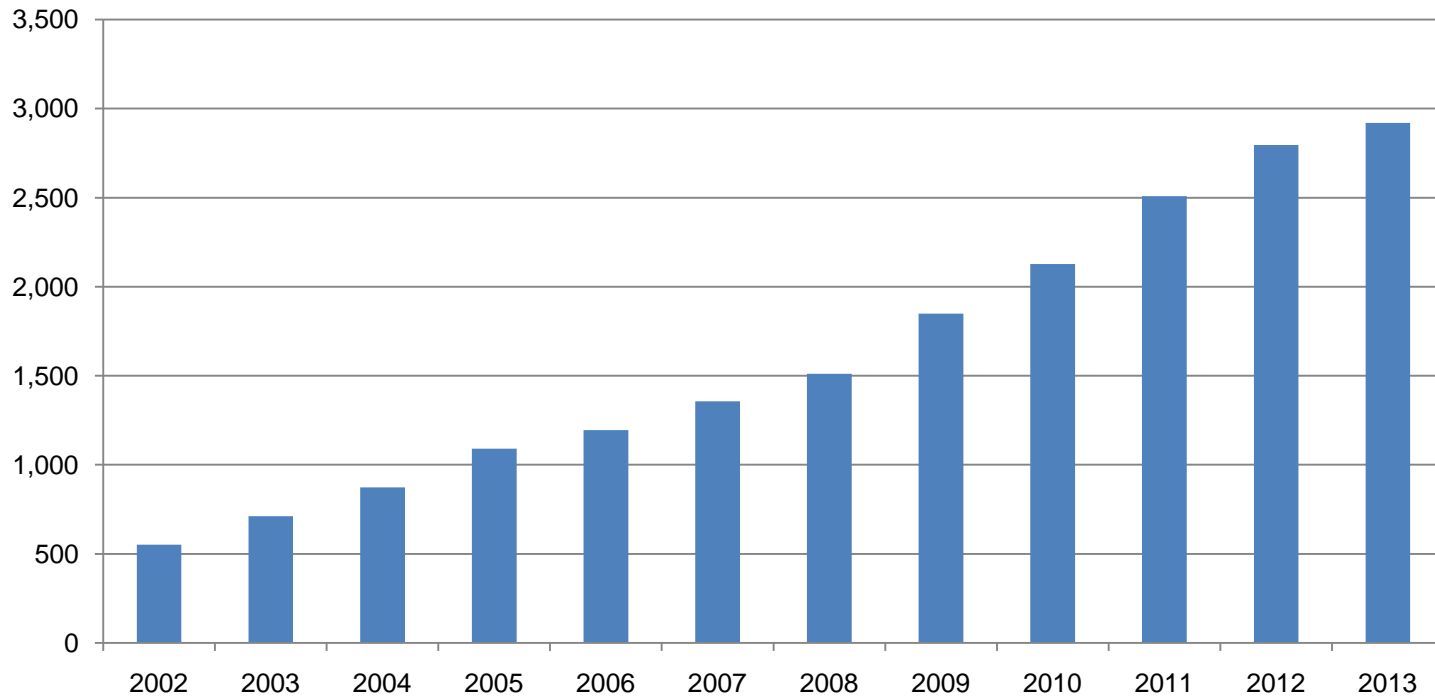
- ◆ Owner of 1 power reactor in New Brunswick



- ◆ Research reactors Manitoba and Ontario

# How much money is in the trust funds?

## 2014 NFWA Trust Funds (\$2.9 billion)





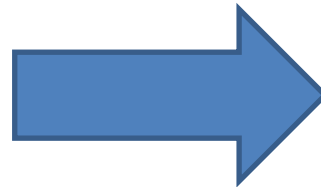
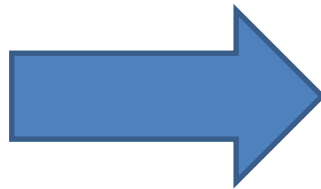
# 2014 NWMO Funding

**ONTARIO POWER  
GENERATION**

**Hydro  
Québec**

**Énergie NB Power**

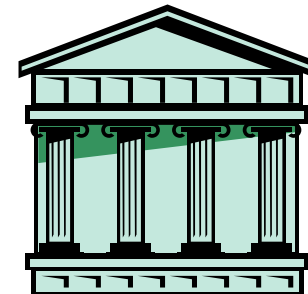
**AECL**



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NUCLEAR WASTE MANAGEMENT ORGANIZATION SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

***NWMO operations***  
(~\$77M in 2014)

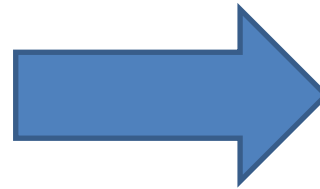


***NFWA Trust Funds***  
(~\$178M in 2014)

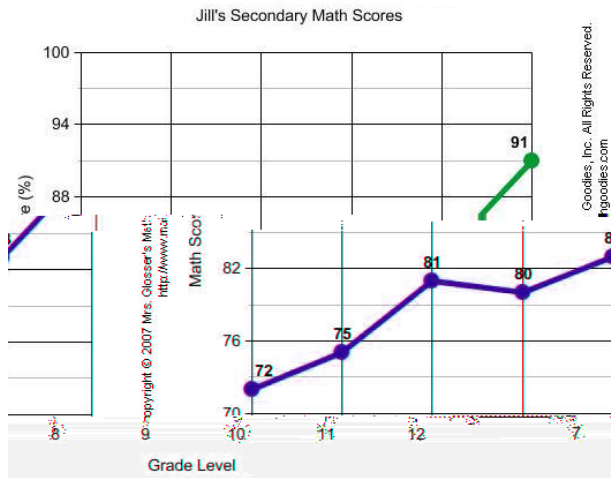
# NFWA Trust Fund Deposits

## *Funding Formula*

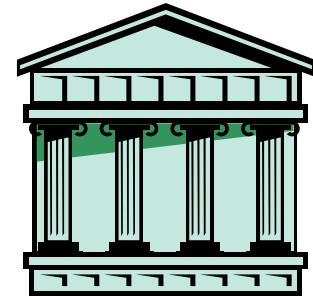
### *Cost Estimate*



### *NFWA Trust Funds*



~\$178M in 2014



# Funding Formula – Key Principles

## Producers Pays

- Cost share based on fuel quantity and repository usage

## Financial Conservatism

- The highest cost scenario of Adaptive Phased Management is used

## Uncertainty Analysis

- Contingencies to provide for unforeseen events

## Intergenerational Fairness

- Collection of funds over the economic life of reactors

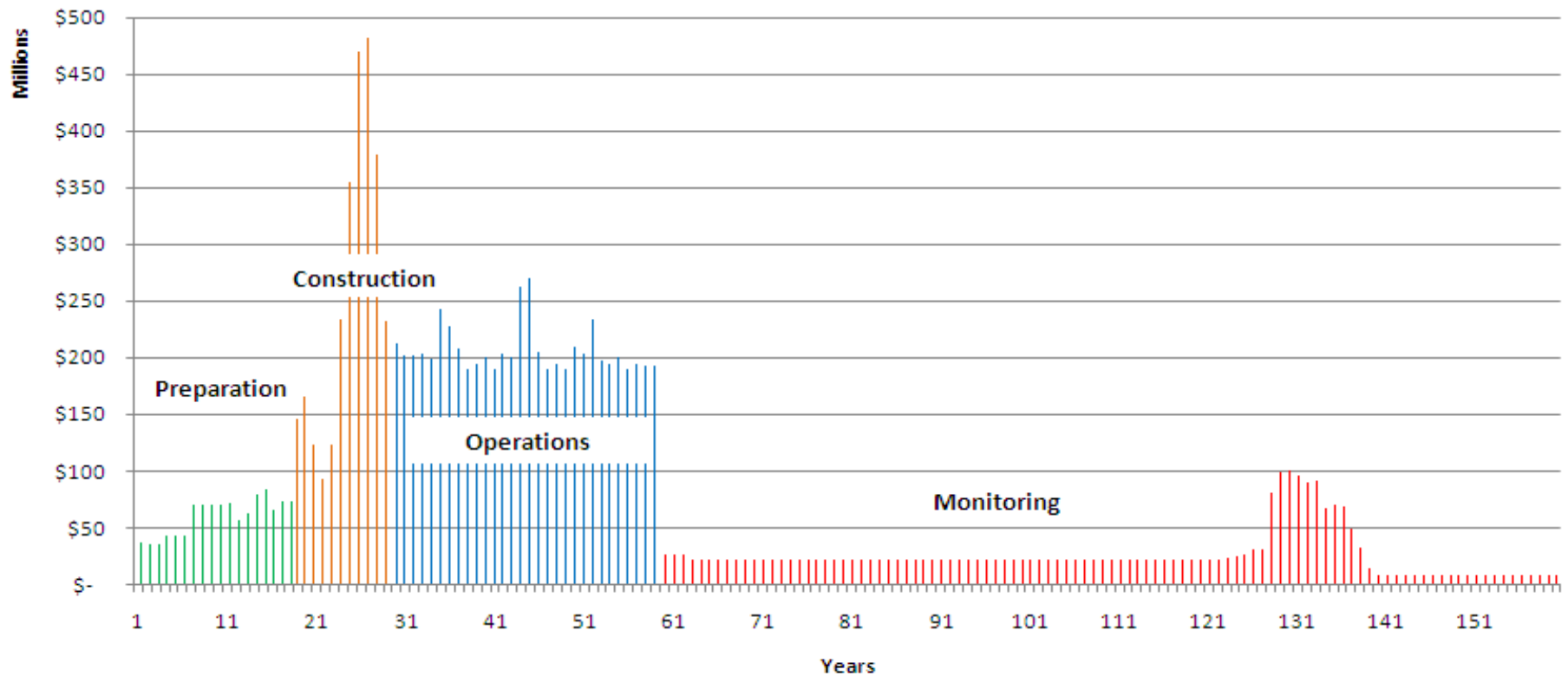
## Fund Growth

- Reasonable assumptions used for fund growth



# APM Lifecycle Cost Estimate

Current Annual Expenditures by Phase for the APM Project



# NWMO Cost Estimates – NWMO inputs

- 43 -

Table 5.5: Base Case NWMO APM Project Cash Flow

Development Phase	TOTAL	05 Building Relationships	10 Adapting To Change	15 Siting	20 Design Development & Safety Case	25 Confidence Building & Process Understanding	30 Site Verification & Licensing Support	90 Common Services
Siting (Y1-9)	\$766,875,190	\$77,036,367	\$9,765,312	\$457,496,780	\$90,121,558	\$45,180,277	\$2,185,380	\$85,089,516
Construction Licence Application (Y10-Y15)	\$500,720,720	\$60,452,565	\$4,864,283	\$59,427,443	\$186,367,888	\$27,250,000	\$87,668,389	\$74,690,152
Construction UDF (Y16-Y20)	\$274,245,807	\$42,553,633	\$1,020,954	\$11,468,750	\$84,457,192	\$23,625,000	\$62,117,352	\$49,002,926
Construction DGR (Y21-Y25)	\$268,040,655	\$42,478,633	\$590,505	\$8,368,750	\$42,563,509	\$59,750,000	\$65,706,004	\$48,583,254
Operation (Y26-Y55)	\$473,524,290	\$140,616,982	\$2,952,275	\$22,500,000	\$10,577,385	\$28,125,000	\$241,836,811	\$26,915,837
Extended Monitoring (Y56-Y125)	\$446,238,693	\$135,702,760	\$6,888,641	\$8,750,000	\$11,391,030	\$0	\$269,615,232	\$13,891,030
Decommissioning & Closure (Y126-Y150)	\$139,071,762	\$34,260,570	\$2,460,229	\$0	\$0	\$0	\$80,959,973	\$21,390,990
Postclosure Monitoring (Y151)	\$67,969,036	\$156,250	\$0	\$0	\$0	\$0	\$67,812,786	\$0
<b>TOTAL</b>	<b>\$2,936,686,153</b>	<b>\$533,257,760</b>	<b>\$28,542,199</b>	<b>\$568,011,723</b>	<b>\$425,478,562</b>	<b>\$183,930,277</b>	<b>\$877,901,927</b>	<b>\$319,563,705</b>

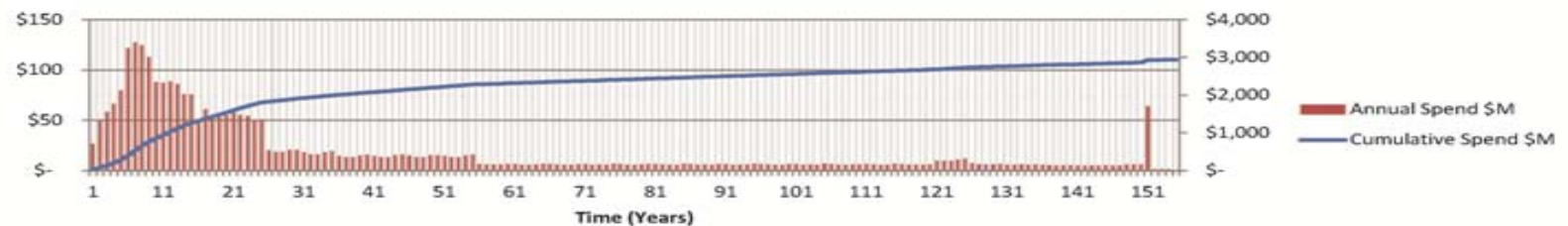


Figure 5.1: Base Case NWMO APM Project Annual Cash Flow and Cumulative Costs

# NWMO Cost Estimates – DGR

Comp	WBS	Description	Total
DGR	560.40.10.30.10	UDF EQUIPMENT	\$ 1,154,000
DGR	560.40.10.30.20.20	CONCRETE PLANT	\$ 1,588,689
DGR	560.40.10.30.20.40	CAMPSITE AND CAMPSITE OPERATIONS	\$ 62,225,000
DGR	560.40.10.30.20.50	SERVICE SHAFT AND HEADFRAME	\$ 92,737,744
DGR	560.40.10.30.20.70	TUNNEL AND SERVICE AREA EXCAVATION	\$ 78,904,981
DGR	560.40.50.130	PROCESS WATER SETTLING POND	\$ -
DGR	560.40.50.140	SERVICE SHAFT WATER SETTLING POND	\$ -
DGR	560.40.50.150	STORM RUN-OFF POND	\$ -
DGR	560.40.50.250	VISITORS CENTRE	\$ -
DGR	560.40.50.60	WALKWAYS/SERVICEWAYS	\$ -
DGR	560.40.50.80	SECURITY CHECKPOINTS	\$ -
DGR	560.40.60.20	MAIN SHAFT AND HEADFRAME	\$ 59,789,437
DGR	560.40.60.30	VENTILATION SHAFT AND HEADFRAME	\$ 46,971,101
DGR	560.40.70.20	FACILITY COMMUNICATION SYSTEM(S)	\$ -

# Work Element Definition Sheet

28-Jul-2010 4:37:21 AM WEDS ID # 7012

Organization Name: Hwozdyk Inc.  
 Prepared by: Leo Hwozdyk Reviewed by:  
 Modified by: Last Modification Date: 4-Dec-2010

WBS Case: 560 DEEP GEOLOGICAL REPOSITORY (Crystalline, "In-Floor", 3.6M)  
 WBS Number: 560.40.10.30.10 UDF EQUIPMENT

**WBS Description:**

Underground development facility (UDF) equipment encompasses specialty equipment required for the research functions of the UDF. These functions will be specified in detail as UDF design and licensing proceeds.

(This element was formerly named "UCF Design" - Underground Characterisation Facility Design. The current contracting strategy is to procure the UDF on an Engineer, Procure and Construct, EPC, basis, in which the contractor's price includes detailed design. Facility requirements will be developed by NWMO as part of Repository Engineering, Safety Assessment and allied efforts. Support installations associated with the UDF, such as maintenance shops, located in the main and service shaft complex, are included in work element .40.10.30.20.70, "Tunnel and Service Area Excavation")

**WBS Deliverable:**

Initial set of specialized UDF equipment as required for UDF research activities (support installations, such as maintenance shops, located in the main and service shaft complex, are included in work element .40.10.30.20.70, "Tunnel and Service Area Excavation")

**WBS Assumptions:**

Initial cost allotment on the basis of a full set of Used Fuel Container (UFC) emplacement equipment for testing and evaluation.

Exclusive of contingency.

**WBS Allowance Basis:**

20% allowance included for miscellaneous charges related to procurement and installation of itemized equipment set.

Start Year: 21 Finish Year: 21 Duration: 1 year(s) WBS Type: Fixed

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	Total Cost
		\$1,154,000	\$1,154,000	20%	\$1,384,800

WBS Specific Supporting Documentation:

Multi Element Supporting Documentation:

Crystalline conceptual design TM12A - September 10 CLEAN COPY.doc  
 Development Schedule - Crystalline Rev04.xls  
 Mining Cost Basis Model - Cstmdl\$Cdn\_Rev\_NWMO\_Rev04 edit.pdf

# How much will it cost?

- Eventual cost depends on: the volume of fuel, location of the facility, surrounding infrastructure, rock type, design of the repository, and other factors.
- \$20 billion (2014\$) or \$8.4 billion in present value for 3.6 million bundles.
- Unit cost = 0.1 ¢ / KWh





# How many bundles have been created?

- 2.4 million bundles have been created as of June 30, 2013.
- Current projection of the final volume from existing reactors is between 3.4 to 5.2 million bundles.



# What is the funding status of the 2.4 million bundles created?

- Total cost = approx. \$7 billion in 2014 present value.
- Post-construction licence cost portion = \$5 billion.
- NFWA Trust Fund balance = \$2.9 billion
- ~58% funded



# Ongoing Update of Cost Estimate

- Annual Assessment of all factors that impact APM cost estimating and funding requirements;
- Publish audited financial statements of trust funds annually;
- Update trust fund contribution requirements annually;
- Conduct a comprehensive update of the lifecycle cost estimate every 5 years at a minimum

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