OPG'S LONG TERM MANAGEMENT PROPOSAL FOR LOW AND INTERMEDIATE LEVEL RADIOACTIVE WASTE: PROJECT DESCRIPTION, OPERATIONS

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ABSTRACT

Although the Deep Geologic Repository (DGR) is approximately 8 years away from being placed into service, it is time to start planning for operations. Ontario Power Generation's (OPG) Nuclear Waste Management Division (NWMD) has a systematic approach to preparing for operation of any new facility that is readily applicable to the DGR. The DGR Operational Readiness Plan has been benchmarked at similar facilities in North America and Europe. The operating vision is a living model, and is constantly being reviewed and refined to align with the detailed design of the DGR as it proceeds through its phases of development.

Combined with 40 years of operating surface storage facilities for the storage of Low and Intermediate Level Waste (LILW), the DGR operating vision will enable NWMD to provide meaningful input during COMS (Constructability, Operability, Maintainability, and Safety) review in the DGR project detailed-design phase in 2011/2012. A Work Breakdown Structure has been used to communicate the detail of the operating vision, and also to estimate the costs of Operational Readiness and Operations during the lifetime of the facility.

1. OPG'S SYSTEMATIC APPROACH TO THE DGR PROJECT AND FUTURE OPERATIONS

OPG uses a consistent, systematic approach to the design, construction, commissioning and operation of all of its nuclear facilities. This approach is documented in the governing document framework derived from OPG's Nuclear Safety Policy, and sets the standards for Operational Readiness and Operating activities such as:

- Conduct of Operations, Maintenance and Engineering, including turnover and commissioning of new facilities;
- Preparation of documents required for application for the Operating Licence;
- Training and qualification of DGR staff; and
- Compliance with applicable Environment, Health and Safety standards, including ISO 14001 and OHSAS 18001.

2. A BRIEF DESCRIPTION OF THE DGR AND THE WWMF SITES

The DGR surface works will be immediately north of and joined to the existing Western Waste Management Facility (WWMF) via a crossing over an abandoned rail line (Figure 1). This crossing will be used for waste transfer. DGR staff will access the DGR facility through a different route via the Bruce Site Interconnecting Road, designated parking and the DGR surface works.

The DGR underground storage rooms will be approximately 680 m below surface. Waste and personnel will travel through the main shaft. There will be a separate ventilation shaft with a hoist for emergency egress during the operational phase. Infrastructure and amenities will be provided at each facility for the staff and activities specifically taking place there.

The reference capacity of the DGR is 200,000 m^3, which will be fully developed during the construction phase. Operations will not commence until the construction phase is completed, which will be managed by the Nuclear Waste Management Organization (NWMO) on behalf of OPG. Another operational prerequisite for OPG is to obtain an Operating Licence from the CNSC.

3. THE OPERATING VISION

An operating vision is being developed for future activities at both the WWMF and the DGR. It will be continuously updated based on safety and ALARA assessments during the detailed design process. LILW Operations in the future will encompass:

- LILW receiving, processing, storage, retrieval, repackaging and staging at the WWMF,
- LILW transfer via the crossing to the DGR,
- LILW receiving, staging and transfer onto the main shaft cage,
- Lowering LILW down the main shaft,
- LILW handling and emplacement into the storage rooms,
- Other operating and maintenance activities.

Before any waste packages are transported to the DGR, they will need to meet waste acceptance criteria.

When the DGR is ready to operate, LILW from the nuclear generating stations will continue to be received at the WWMF rather than going directly to the DGR. The reasons for this are as follows:

- The DGR will operate a day shift only whereas the WWMF is a shift operation, and waste shipments are sometimes received outside of day shift;
- LLW will continue to be processed for volume reduction;
- The flow of waste into the DGR will be planned and controlled using a Staging Building. The current proposal is to empty and modify Low Level Storage Building (LLSB) #3 for this purpose, since it is located closest to the crossing between the WWMF and the DGR. The schedule for the construction of additional LLSB's would be adjusted to support this concept;
- Considering ALARA, intermediate level waste will continue to be stored for a period of time using in-ground storage at WWMF. This will allow radioactive decay to reduce occupational gamma dose rates before the waste is transferred to the DGR.

However, the DGR design will allow LILW receipt directly at the DGR without moving through the WWMF first. This will increase future operational flexibility.

Containers destined for the DGR must have no loose contamination on the outside and must meet a contact gamma dose rate criterion of less than 200 mrem/h (2 mSv/h). Waste being retrieved from storage at WWMF will be assessed against these criteria at its current storage

location before being transferred outdoors to the staging building. Some of the non-processible waste currently stored in LLSBs will have to be overpacked for shielding since the WWMF Operating Licence allows storage with contact gamma dose rates of up to 1000 mrem/h (10 mSv/h). Waste packages in LLSBs will also have to be assessed for structural integrity, to ensure that any loose contamination will be contained during the transfer to the Staging Building, and from there into final storage in the DGR.

LLW currently stored in Trenches, and ILW, currently stored in In-ground Containers, will also have to meet the same criteria for loose contamination and contact gamma dose rate prior to transfer to the Staging Building. The reason that the contact gamma dose rate limit is lower for waste going to the DGR than it is for interim storage on surface is due to the method of transfer. Forklift operators will have longer exposure times for the transfer of the vast majority of LLW going to the DGR than for its previous storage in LLSB's. The ALARA assessments performed to date indicate that waste handlers carrying packages on forklifts will be the most dose-exposed individuals working at the DGR.

A LILW Operations work crew will take the waste from surface storage to the Staging Building. DGR waste handlers will go the staging building to collect waste, and ensure that it meets the waste acceptance criteria before beginning to transfer it by forklift. The types and quantities of waste packages to be picked up at staging will depend on the DGR facility plan for the day.

The forklift will travel along a dedicated path from the Staging Building to the DGR's Waste Package Receiving Building (WPRB). This path will be securely fenced and safely managed for both the workers and the public (radiological Zone 2). Inside the WPRB, waste will be staged then placed onto a rail cart. The rail cart will travel onto load cells and measurement devices to confirm its weight and dimensions before travelling into the waste hoist cage.

The main shaft of the DGR will contain both the waste hoist and the personnel hoist. The waste hoist is not intended to carry people, and the personnel hoist will not travel at the same time as the waste hoist. The waste hoist will take about 3 minutes to travel to the repository depth. The cycle time for loading the rail cart, travelling to repository depth and unloading the rail cart is expected to take about 20 minutes. If the hoist is carrying low-level waste, it will accommodate a minimum of 2 waste bins at a time. If it is carrying intermediate-level waste, it will accommodate one package at a time.

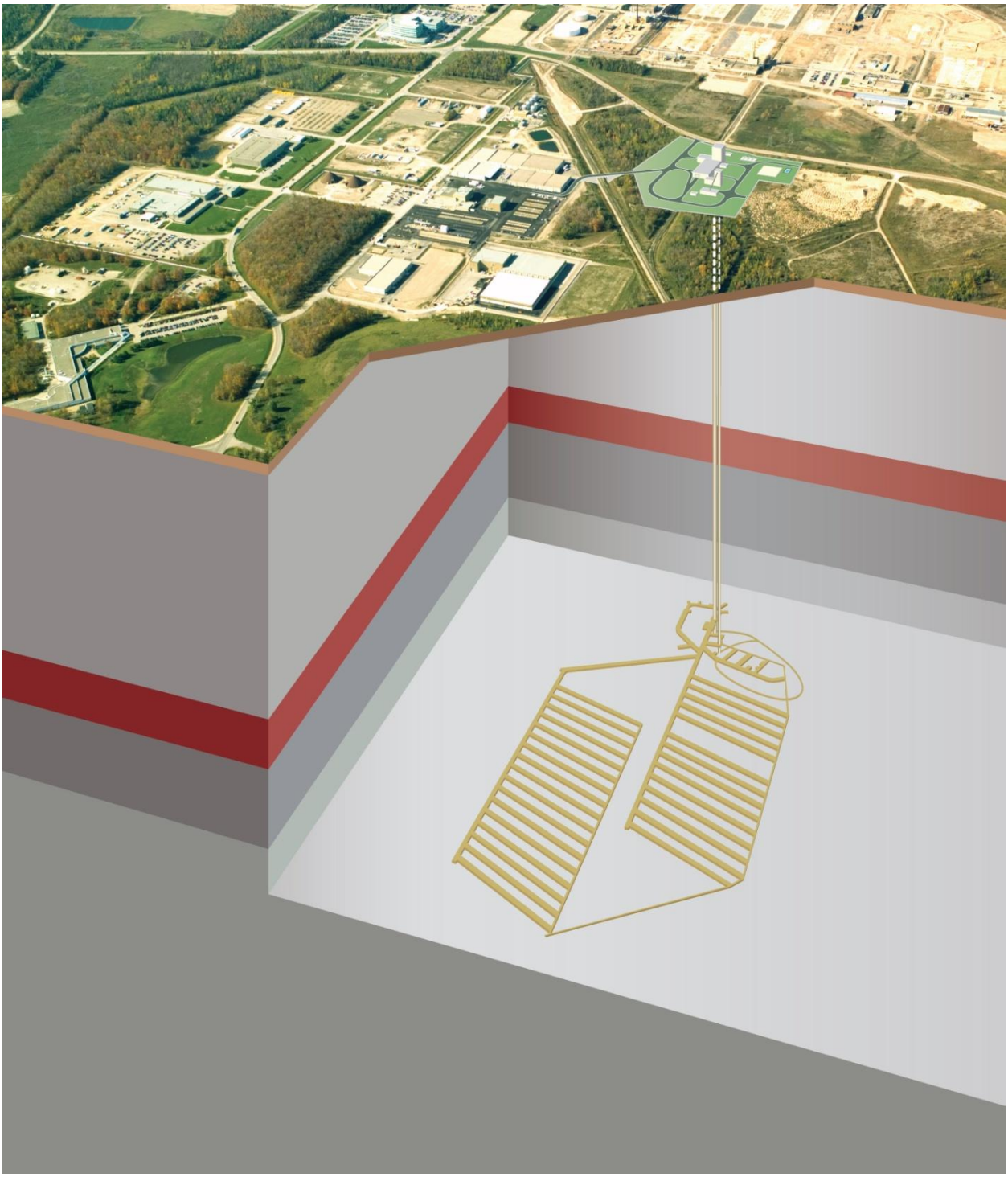

Figure 1: Aerial view of the DGR

Preliminary studies performed by OPG indicate that the waste retrieval rate, not the hoist capability, will be the limiting factor determining the waste volume to be transferred each day.

The operation of the WWMF will include the ongoing receipt and storage of LILW from the nuclear stations and the management of the waste inventory but will also include the simultaneous retrieval of waste for the DGR. Plans are currently under development to align waste retrieval with waste transfer to the DGR.

All operational areas at the DGR will be Radiological Zone 2 meaning that loose contamination is not normally expected to be present and low gamma dose rates will be present from waste packages. If loose contamination is detected due to an upset condition, the OPG Radiation Protection Program [1] provides for decontamination within the Zone 2 environment. Zoning the facility in this manner creates a culture of contamination control with the expectation that the facility is normally free of loose contamination.

The underground layout of the DGR is illustrated in Figure 2.

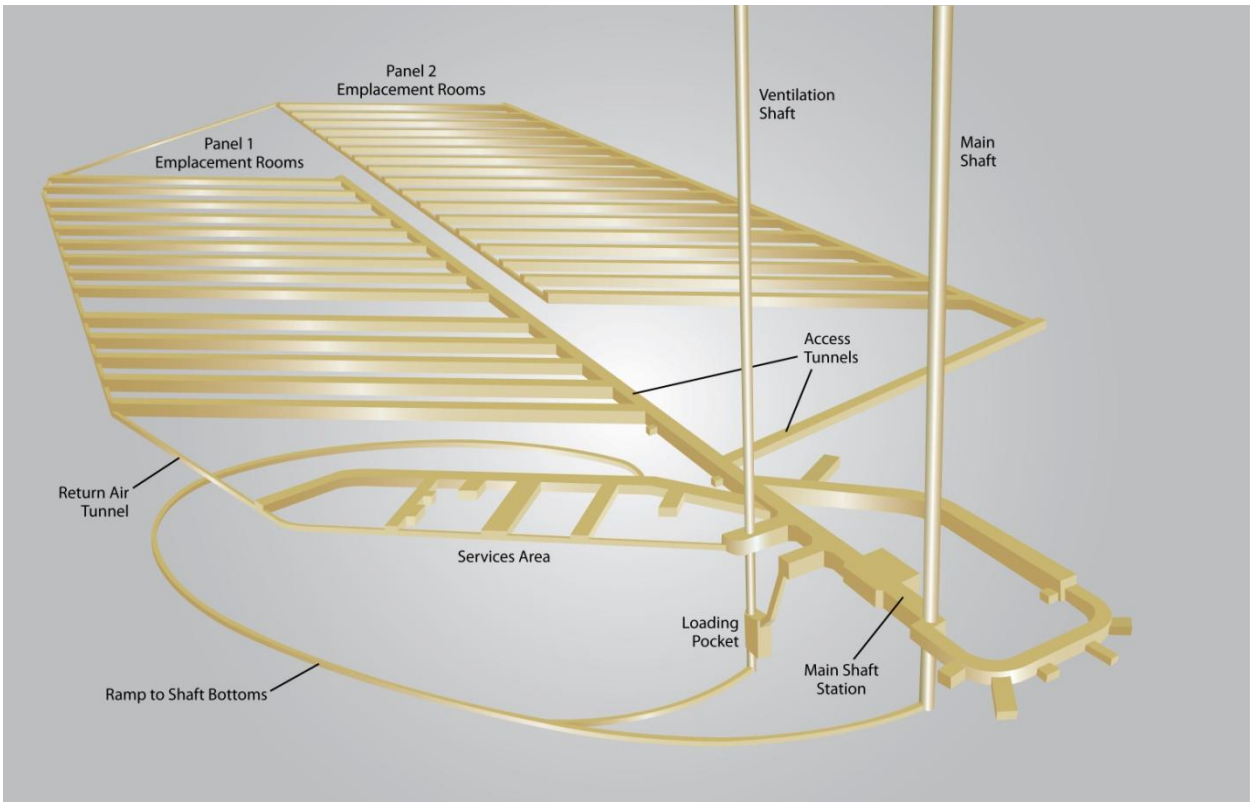

Figure 2: Underground layout of the DGR

When underground, waste will normally be transferred and stored by forklift. This equipment will be maintained in the underground Services Area. There is provision in the DGR design to have craning and a rail system available for the emplacement of large, heavy items in the rooms closest to the hoist.

ALARA considerations affect the strategy and sequence of storage locations. Empty rooms will have physical barriers to prevent access before they are scheduled for waste emplacement. LLW and ILW will not normally be emplaced in the same room. Once a room is filled, the dose rate at its entrance will be assessed with shielding incorporated when necessary into the new entrance.

Once Panel 2 is filled, a closure wall will be emplaced to seal the panel. Then, the end of Panel 1 farthest from the hoist will be filled, working backwards progressively closer to the hoist.

Waste data, including storage location, waste type and contact gamma dose rate, will be tracked using a computer database.

4. OPERATIONAL WORK BREAKDOWN STRUCTURE

4.1 Operational Readiness

Planning for Operational Readiness for the DGR began in the Preliminary Design phase. The creation or updating of governing documents will begin in 2011. Staffing for the facility will begin in 2012, with the required lead-in times for management, supervisory, engineering and trades staff.

The Operational Readiness Work Breakdown Structure describes the elements of the work and who might perform them (Figure 3). The cost of Operational Readiness was estimated using this structure.

4.2 Operations

Similarly, the Operations Work Breakdown Structure divides the work to be achieved into its elements and the proposed responsible group (Figure 4). This was used to estimate the cost of operating the facility over its lifetime.

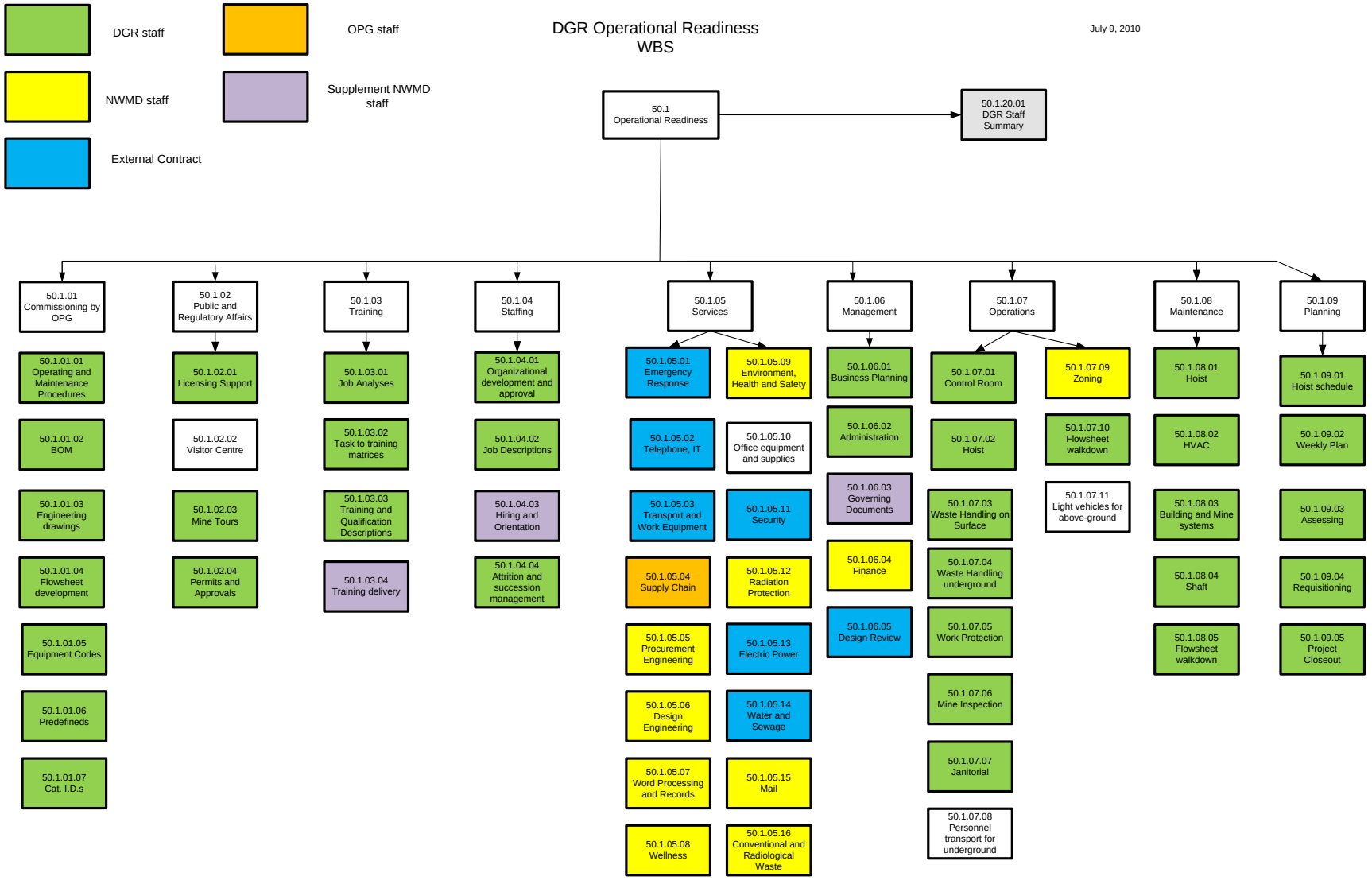

Figure 3: DGR Operational Readiness Work Breakdown Structure

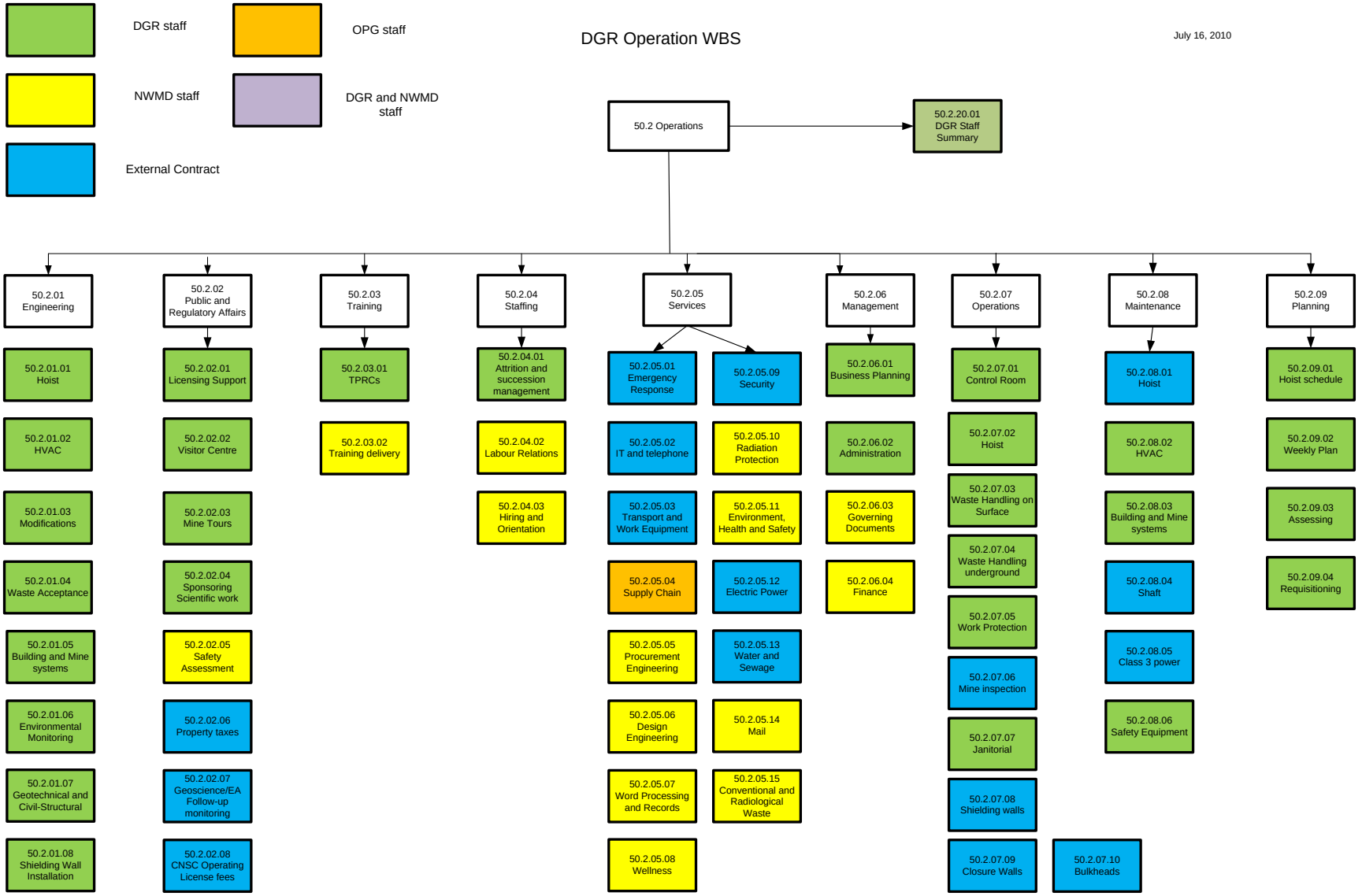

Figure 4: DGR Operations Work Breakdown Structure

5. CONCLUSIONS

Operational readiness planning for the DGR Project has begun. Integrating an operating vision into the project at this early stage has led to valuable input to the environmental assessment and Site Preparation and Construction Licence application, and will continue to provide input into the detailed design phase of the project.

6. REFERENCES

[1.] "Radiation Protection", Ontario Power Generation Document Number N-PROG-RA-0013.