OPERATIONS CAPITAL

1.0 INTRODUCTION

Operations capital investments are required to implement, enhance and modify the physical infrastructure, systems and tools required for distribution operations. These investments deliver improvements to Distribution System performance in the form of reduced outage duration, improved customer satisfaction, and accurate information for regulatory reporting as required by the Distribution System Code. They also deliver efficiency improvements to Hydro One Distribution's operating function and ensure that sustainment costs for infrastructure, systems and tools are minimized. Hydro One has been proactive in assessing and implementing technologies to improve the operation of the distribution system and the expectation is that continued emphasis in this area will be required given the implementation of Smart Grid technologies.

2.0 DISCUSSION

Hydro One Distribution operates the 13kV, 27.6kV and 44kV portions of the distribution system and dispatches the entire distribution system from the Ontario Grid Control Centre (OGCC). The OGCC is a shared facility which allows central operations of the distribution and transmission systems and is backed up by facilities located at a separate site, in the event that the OGCC is unavailable.

A suite of systems and tools is used to receive customer outage information and dispatch field crews, plan and schedule distribution outages, monitor and control the distribution system, and to provide distribution system performance information. As discussed in Operations OM&A, the systems and tools include the Outage Resource Management System ("ORMS"), ORMS Interactive Voice Response, the OGCC Integrated Voice System, the

Provincial Mobile Radio System, the Network Management System ("NMS"), Network Outage Management System ("NOMS"), the Utility Work Protection Code System, Electronic Logging, the Distribution and Station Operating Diagrams, the OGCC Weather System, the OGCC Emergency Services Information System, the Control Room Wallboards and Displays, and Media Notifications.

Most Operations systems are mature installations which are functioning well and fully delivering their intended benefits. However, the Ontario government's Green Energy and conservation initiatives are having a major impact on distribution operations. As a result, several major investments will be needed to meet the challenge posed by these initiatives.

The Green Energy & Economy Act 2009 will result in the installation of large amounts of renewable electricity generation within the distribution system. In order to ensure reliability and power quality, the OGCC will become the 'controlling authority' for areas where distributed generation is installed. Initially, existing NMS functionality will be extended to allow monitoring and control of Distributed Generation ("DG") facilities from the OGCC. Subsequently, it will be necessary to assess the operational need for a Distribution Management System ("DMS") and to implement such a system to provide automated monitoring and control of the distribution system, to provide security and reliability assessment on the distribution system, and potentially to dispatch DG.

The Smart Meter Program, mandated by the Energy Conservation Responsibility Act, will also have a major impact on Operations. Smart meters will have the ability to improve outage management by detecting automatically whether a customer is experiencing a power outage. Incorporating outage information from smart meters into ORMS will improve the efficiency and performance of outage management and increase customer satisfaction. The Smart Meter program will require a wireless communication network which provides the means to remotely control distribution equipment via the

enhanced NMS or future DMS. In addition, the communications network will provide wireless connectivity which can be used to improve the dispatch of field crews using mobile computing resources. The convergence of distributed generation, distribution automation and smart metering is typically referred to as the Smart Grid.

These initiatives will require enhancements to the suite of systems and tools used to receive customer outage information and dispatch field crews, plan and schedule distribution outages, monitor and control the distribution system, and to provide distribution system performance information.

Proposed spending for 2010 and 2011 along with the spending levels for the historic and bridge years are provided in Table 1 below.

Table 1
Operations Capital

Description	Historic			Bridge	Test	
	2006	2007	2008	2009	2010	2011
Operations Capital	2.1	2.0	0.9	2.4	8.1	11.2

Major increases in 2010 and 2011 above historic levels are required to meet the significant challenges associated with DG and Smart Grid.

3.0 OPERATIONS PROJECTS

System Enhancement projects provide significant improvements to OGCC systems and tools. Specific projects planned for 2010 and 2011 are described below. Investment Summary Documents ("ISDs") for projects with net capital requirements over $1 million can be found in Exhibit D2, Tab 2, Schedule 3.

3.1 Distribution Management System

This investment will provide initial funding for assessment and product selection of a Distribution Management System ("DMS") appropriate for monitoring and operational control of the Distribution System. As more DG enters the system from multiple locations, additional tools will also be necessary to effectively manage these facilities.

A DMS provides security and reliability assessments, in addition to a suite of tools linked to SCADA telemetry that provide the dispatcher/operator with displays to monitor and control the state of the distribution network in real time, including the status of breakers, switches and sectionalizers. A DMS will include study mode capability for analysis of different configurations of the network including online three-phase unbalanced distribution power flow, contingency analysis, switch order management, short-circuit analysis, volt and VAR management, and line loss analysis.

While mid-feeder reclosers deliver benefits on a stand-alone basis in automatic operation, greater benefits are achieved when they can be remotely monitored and operated from the control centre. The end result is expected to be a 25% improvement in reliability performance as defined in the SAIDI index. This investment provides the system enhancements required at the OGCC to deliver those benefits. This investment will improve the accuracy of regulatory distribution performance measures, improve control room efficiency, improve the customer notification process for feeder outages, and reduce costs for DS Operating Diagram maintenance.

The test year cost for this work is $0.6 million in 2010 and $1.3 million in 2011. This investment contributes to Hydro One Distribution's smart grid strategy. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.

3.2 Real-Time Feeder Analysis

Load transfer studies on Hydro One Distribution's 28 kV and 44 kV feeders are used to assist OGCC Controllers and Outage Planners in determining the optimum configuration for load transfers between distribution feeders for planned and unplanned outages. Currently, 600 studies are carried out annually by technical field staff in anticipation of emergency situations or in response to planned work that requires an outage. When emergencies do occur, the recommendations of the analyses are used to transfer loads and restore power as quickly as possible. For some unanticipated emergency situations, operators do not have study findings and do not have the ability to analyze data in real time. This can result in load transfers that have not been verified in relation to existing protection constraints.

The Real-Time Feeder Analysis project supports the acquisition and development of tools that will assess distribution load transfers for planning and real time needs. This will enable the OGCC to deploy alternate feeder configurations quickly and expedite restoration of some or all of the affected customers during outages. Real-time feeder analysis tools will be used to determine voltage, ampacity, fault levels and verification of protective relay settings for abnormal feeder configurations.

The cost for this project is $0.3 million in 2010 and $1.2 million in 2011. This investment contributes to the Smart Grid strategy and will eventually become part of the DMS. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.

3.3 Integrating Smart Meter Data in ORMS

ORMS receives most unplanned outage information from customer phone calls. This is achieved through interfaces to the software used by the Call Centre agents and to the Call

Centre IVR system. The installation of Smart Meters and Smart Grid connectivity to retrieve data creates an opportunity to improve the efficiency and accuracy of ORMS data with respect to the prompt identification of the existence, location and extent of outages. The cumulative benefits to outage management will be improved reliability performance through better and more complete monitoring and reporting, enabling quicker response times and timely correction of emerging issues.

This investment will require new hardware and software features in the central smart meter data collection facilities and in ORMS to allow this information exchange to take place in near real time.

The cost of this project is $1.6 million and $2.1 million in 2010 and 2011. This investment contributes to Hydro One Distribution's Smart Grid strategy. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.

3.4 ORMS Mobile IT with CAD Integration

ORMS Mobile IT Integration will provide software modifications in order to facilitate mobile computing resources for field crews. The adaptation will provide integration of the Computer-Aided Dispatch module of ORMS with the version currently operated by Provincial Lines. A recent pilot of this technology confirmed that this would increase efficiencies in Distribution Operations. Dispatchers will be able to dispatch Distribution crews directly from ORMS, thereby improving restoration times. This capability will also allow field crews to enter data such as updated restoration times directly to ORMS.

The cost of this project is $1.0 million annually in 2010 and 2011. This investment has been identified as contributing to the Smart Grid strategy. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.

3.5 Geospatial Integration & Information Viewer

Much of the information required to optimize operation of the Distribution Network is most effectively presented on geographic displays. This investment will leverage the corporate GIS project to deploy GIS tools to the OGCC Control Room. These tools will integrate the display of information such as weather, lightning, emergency services provider data and location of faults layered on top of the Distribution Line GIS displays. It will also provide the DMS with geographic coordinates of distribution assets.

The 2010 and 2011 costs for this project are $0.6 million annually. This investment has been identified as contributing to the Smart Grid strategy. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.

3.6 Network Operations Buildings Sustainment

This investment will be required to sustain operational readiness of building facilities, including back office, computer rooms and backup centre. Current business requirements are having a significant impact on space availability and operating efficiency at the OGCC. In addition, investment is required to improve available space and physical plant (e.g. uninterruptible power supply, heating and ventilation) for computer rooms.

The 2010 and 2011 costs for this project are $2.4 million and $2.3 million respectively. This investment has been identified as contributing to the Smart Grid strategy. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.

3.7 Distribution Operating Facilities Sustainment

This investment is required to provide capital sustainment of distribution operating facilities such as ORMS, IVR, IVS, wallboards and displays. The OGCC was commissioned in 2004, and some Distribution Operating Facilities were actually commissioned in 2001 and 2002, prior to being moved to the OGCC. As a result, some Distribution Operating Facilities are currently reaching end-of-life and will be requiring refurbishment and capacity expansion in 2010 and 2011, including the Integrated Voice System ("IVS"), wallboard and operator displays.

The costs for this project are $1.3 million annually in 2010 and 2011. For additional details, refer to the ISD in Exhibit D2, Tab2, Schedule 3.

3.8 ORMS Upgrade

ORMS is the critical outage management tool that was placed in-service in 2003. As typically occurs with software applications, the vendor is continuously upgrading the software and after a series of upgrades and version changes withdraws support for older versions. This was recognized in 2007, when a version upgrade to ORMS was undertaken. A similar need is expected in 2011 and this investment will investigate potential options for upgrading the system. It will consider system growth, new functionality and potential opportunities with the implementation of a Distribution Management System (DMS).

The cost of this project is $0.2 million in 2010 and $1.5 million in 2011. This investment has been identified as contributing to Hydro One Distribution's Smart Grid strategy. For additional details, refer to the ISD in Exhibit D2, Tab 2, Schedule 3.