

1 **DEVELOPMENT CAPITAL**

2
3 **1.0 INTRODUCTION**

4
5 Development capital represents investments required to connect new load and generation
6 customers and to enhance existing, or construct new, distribution facilities. These
7 investments ensure the system's capability to provide a secure and reliable supply of
8 electricity in response to new large load customer connections, cumulative system-wide
9 load growth and system demands associated with new generators. Growth is predicted
10 through the combined use of load-forecast models, historical growth patterns, and
11 specific load measurements taken at times of heavy loading during the year.

12
13 **2.0 DISCUSSION**

14
15 Development capital programs fund both planned and demand (unplanned) work.
16 Demand work represents the largest component of the program and involves work
17 required to connect new load or generator customers, or to modify customers' present
18 service, as required. Planned work includes projects designed to increase the capability
19 of existing lines and stations, or to construct new lines and stations in response to system
20 load growth forecasts.

21
22 The net capital spending for 2010 and 2011 along with the spending levels for the bridge
23 and historic years are provided in Table 1.

Table 1
Summary of Net Development Capital
(\$ Million)

Description	Historic			Bridge	Test	
	2006	2007	2008	2009	2010	2011
Connections, Upgrades and Cancellations	104.6	105.9	101.8	98.0	113.5	115.4
System Capability Reinforcement	29.7	36.9	36.7	41.4	47.0	50.9
Generation Connections	1.5	1.8	3.9	5.6	9.1*	14.8*
Generation Connection Enhancements	0	0	0	0	7.4**	18.6**
Wholesale Revenue Meters	11.1	9.7	10.8	7.7	7.9	2.8
Smart Grid	0	0	0	15.2	20.8	49.9
TOTAL ***	146.8	154.2	153.2	167.9	205.7	252.4

* Gross costs of \$106.0M (2010) and \$167.1M (2011) *net of* \$13.3M (2010) and \$26.8M (2011) to be funded by generators and *net of* \$83.6M (2010) and \$125.5M (2011) to be funded by revenues from external sources

** Gross costs of \$62.4M (2010) and \$129.1M (2011) *net of* \$55.0M (2010) and \$110.5M (2011) to be funded by revenues from external sources.

*** Total Development Capital is *net of* \$13.3M (2010) and \$26.8M (2011) to be funded by generators and *net of* \$138.6M (2010) and \$235.9M (2011) to be funded by revenues from external sources.

The 2010 and 2011 proposed spending is significantly above historic averages. This is predominantly attributed to work associated with the *Green Energy and Green Economy Act, 2009* (“GEGEA”):

- A greater number of generators are expected to connect to the distribution system, which will drive investments in line transfers and system upgrades.
- A new focus on transitioning the current distribution system into a ‘smart grid’ by implementing various new and advanced technologies.
- System enhancements to prepare the distribution system and enable feeders to connect generators in light of the new Feed-In-Tariff (“FIT”) program and generator connections.

- 1 • Increases in System Capability Enhancements to address system loading issues.

2
3 As described in Hydro One Distribution's Green Energy Plan (Exhibit A, Tab 14,
4 Schedule 2) and shown in Sections 2.2 and 2.3 of this Exhibit, a portion of the capital
5 costs associated with Expansion and Renewable Enabling Improvements work that is part
6 of the investments related to generation connections are assumed to be covered by
7 revenues from external sources. Capital investments totaling \$138.6 million in 2010 and
8 \$235.9 million in 2011 are assumed funded by external sources and do not impact the rate
9 base or revenue requirement in this Application

10 11 **2.1 Connections, Upgrades and Cancellations**

12
13 Connections, Upgrades, and Cancellations are considered demand work as these are
14 driven by individual customer requests. The company must respond to these requests and
15 therefore this work is not discretionary. The volume and funding levels of these programs
16 for 2010 and 2011 are based on consideration of historical cost and volumes, and forecast
17 of economic variables such as Ontario GDP and Ontario Building Permits. The
18 Investment Summary Documents ("ISDs") for this program contain further details and
19 may be found in Exhibit D2, Tab 2, Schedule 3.

20
21 The Service Cancellations program involves the removal of Hydro One Distribution
22 owned equipment. These costs are accounted for under depreciation and are therefore not
23 identified in the capital cost tables.

24
25 The proposed funding for Customer Connections, Service Upgrades and Meter Purchases
26 for 2010 and 2011 and the spending levels for the bridge and historic years are provided
27 in Table 2 below.

Table 2
Customer Connections & Service Upgrades
(\$ Million)

Description	Historic			Bridge	Test	
	2006	2007	2008	2009	2010	2011
Customer Connections	80.1	84.6	80.0	77.4	86.6	86.9
Service Upgrades	21.4	19.7	20.7	19.1	21.4	21.6
Meter Purchases	3.1	1.6	1.1	1.5	5.5	6.9
TOTAL	104.6	105.9	101.8	98.0	113.5	115.4

2.1.1 Customer Connections

To comply with its obligations under section 28 of the *Electricity Act, 1998*, Hydro One Distribution is required to provide a connection service to new industrial, commercial, residential, and seasonal customers when requested. The division of costs between Hydro One Distribution and the customer is determined based on the Company's connection policies, which are in accordance with the Distribution System Code ("DSC") requirements. In response to Ontario Energy Board (the "Board") requirements, Hydro One Distribution has established service quality indicators to monitor the responsiveness of Hydro One Distribution to customer's requests for new connections.

Hydro One Distribution provides services for all aspects of a new connection. Activities include line layout, staking, property approvals, installation of poles and conductor, installation of transformation and meters, and approvals required for any new Hydro One Distribution facilities. Customers located adjacent to a line are referred to as "lie along" customers, and under current connection policies, are not required to contribute to the connection cost for a standard type of connection. Customers requiring an upgrade to the "standard connection" are required to pay for the incremental cost of these upgrades. As required by the Distribution System Code those non "lie-along" customers requiring line extensions are required to contribute to the cost of the connection. In accordance with

1 Section 3.3.3 of the proposed amendments to the DSC issued by the Board on September
2 11, 2009, customers who require enhancements to the main distribution system to
3 accommodate a new increase in load will no longer be required to contribute to the
4 capital cost of those enhancements.

5

6 The number of new connections declined in 2008 to approximately 15,800 after reaching
7 a high in 2007. The decline is attributed to the economic downturn, which is forecast to
8 further reduce the number of new customer connections in 2009 to approximately 15,000.
9 In 2010 and 2011, the forecast is for approximately 15,300 connections annually which
10 reflects expected economic conditions. The forecasted number of customer connections is
11 consistent with the distribution load forecasting methodology set out in Exhibit A, Tab
12 14, Schedule 4

13

14 Customer capital contributions have averaged roughly \$19 million in historic years.
15 However, in accordance with the proposed amendment to the DSC noted above, it is
16 estimated that capital contributions will drop to about \$17 million in each of the test
17 years. Included in capital contributions is the recovery of cost for Board-regulated
18 connection activities such as line staking, service layout, etc. as regulated by the Board.

19

20 The 2010 and 2011 spending requirements for this program are \$86.6 and \$86.9 million
21 respectively after deducting amounts recovered from customers.

22

1 2.1.2 Service Upgrades

2
3 To comply with its obligations under section 28 of the *Electricity Act, 1998*, Hydro One
4 Distribution is required to respond to existing customers who require a larger service to
5 accommodate additional load and/or modify the electrical service entrance. The costs are
6 classified as upgrade costs. A service upgrade normally requires the replacement of
7 secondary service wires and the preparation of a service design. Also, it may be necessary
8 to upgrade transformer(s), replace meters or install additional transformers. Volumes of
9 service upgrades for 2010 and 2011 are projected to be about 5,000 based on historic
10 demand. For standard service upgrades, Hydro One Distribution will provide a service
11 layout, pole-mounted transformer, and a meter if required. Hydro One Distribution, in
12 accordance with Distribution System Code requirements, has developed policies
13 concerning the customer capital contributions. As such, cost for service modifications
14 that exceed the standard upgrade installation type would be recovered from the customer
15 on a user-pay basis. Over historic years, these contributions have been in the range of
16 \$4.0 to \$5.0 million.

17
18 The 2010 and 2011 spending requirements for this program are \$21.3 million and \$21.6
19 million respectively after deducting amounts recovered from customers.

20
21 2.1.3 Meter Purchases

22
23 New Connections, and in some cases Service Upgrades require the purchase of new
24 meters. Expenditures for these meters are shown in Table 2. The projected spending for
25 2010 and 2011 is \$5.4 and \$6.9 million. This is an increase over recent historic years (i.e.
26 2007 and 2008) where many of the meters used in new connections and service upgrades
27 were smart meters, and funded under the smart meter program. As the majority of smart

1 meters are now installed, the cost of meters installed as part of new connections and
2 upgrades will once again be funded as part of the normal Development Capital program.

3
4 **2.1.4 Service Cancellations**

5
6 For a variety of reasons, customers may want to disconnect from the distribution system.
7 In these cases, Hydro One Distribution owned equipment is removed, and the remaining
8 installation is left in a safe condition. Costs related to this customer-driven activity are
9 classified as cancellations, and Hydro One Distribution bears the cost of the work
10 involved. Removals of this type are accounted for under depreciation.

11 Volume of Service Cancellations has been in the range of 4,700 to 5,900.

12
13 **2.2 System Capability Reinforcement**

14
15 Investments in System Capability Reinforcement provide for new and modified
16 distribution system facilities to accommodate increases in customer load, system
17 modifications and additions to improve system reliability, as well as additions to the
18 system that will improve operations and asset life cycle planning. These investments are
19 described below with details concerning spending levels provided in Table 1.

20
21 The ISDs for projects and programs greater than \$1 million can be found in Exhibit D2,
22 Tab 2, Schedule 3.

23
24 **2.2.1 Capability Reinforcement**

25
26 Funding for Capability Reinforcement includes investments required to ensure continued
27 capability of the existing system to reliably supply customers in compliance with the
28 Distribution System Code. The need for System Reinforcement projects is identified

1 through system planning studies and load flow analysis funded under Development
2 OM&A, Exhibit C1, Tab 2, Schedule 3.

3
4 Each year new residential customers are connected to the system, as are new commercial
5 and industrial customers. For those loads less than 500 kW, which are the majority of the
6 new connections, system impact assessments are not required. As these customer
7 connections accumulate over time, system elements such as conductors, transformers,
8 regulators, switching elements are operated near their maximum ratings during periods of
9 high load and require relief. These heavily loaded elements require relief or they will
10 eventually fail resulting in damage to equipment and power interruptions. The addition of
11 customers may also result in violations of service standards (i.e. voltage levels and
12 protection criteria) if needed upgrades to system facilities are not done. For load
13 connections greater than 500 kW, station and feeder capability assessments are completed
14 to determine if the system is able to support the increase in load. System improvements
15 for these situations are funded under this program with customer connection costs funded
16 under the New Customer Connection and Service Upgrades program as outlined above in
17 this Schedule.

18
19 Solutions to address increasing customer load can take the form of an increase in
20 conductor size, new supply lines, a new regulating station, voltage conversion, new or
21 increased transformation at a distribution station, or for a significant increase in customer
22 load, the solution may involve new transmission facilities. Hydro One Distribution's
23 planning approach assesses alternatives in a comprehensive manner that includes
24 consideration of both distribution and transmission alternatives, where appropriate, to
25 arrive at the optimum long-term solution. Changes in system losses are also calculated
26 for alternatives and these become part of the decision criteria. For those situations where
27 the preferred option involves the addition of a transmission facility, Hydro One

1 Distribution is required to contribute to the cost of construction of transmission facilities
2 as stipulated in the Transmission System Code.

3
4 Capability Reinforcement investments, for the most part, address customer growth after
5 the fact, except for larger load connections that require significant modifications to the
6 distribution system prior to connection. This program addresses customer growth that
7 has in some cases occurred many years ago, but the system has remained within rated
8 limits until such time as an incremental load increase will approach the system
9 rating/service and/or protection limits. The system is monitored as detailed in the
10 Development OM&A Exhibit C1, Tab 2, Schedule 3 to ensure that conditions that pose a
11 threat to customer reliability and quality of power are addressed in a timely manner.

12
13 In order to maintain the integrity of Hydro One Distribution's system, address system
14 load growth and comply with service quality standards, the 2010 and 2011 spending
15 requirements are \$47.0 and \$50.9 million respectively for Capability Reinforcement
16 Projects. ISDs for projects greater than \$1 million are contained in Exhibit D2, Tab 2,
17 Schedule 3.

18
19 The increases in spending requirements in relation to expenditures in historic years are
20 attributed to increasing needs identified by engineering and technical studies. As
21 discussed in Development OM&A, Exhibit C1, Tab 2, Schedule 3, studies on feeders
22 have been on a 6-year cycle since 2007. Prior to 2007, studies were conducted in a
23 targeted manner based on anticipated needs, or when problems arose or when large
24 customers connected onto a particular feeder. Cyclical studies are identifying a greater
25 need for system reinforcement projects that balance feeders, coordinate protections, and
26 reconfigure feeders as necessary. The cost and duration of individual projects can vary
27 significantly depending on the scope of work required, and historically project costs have

1 ranged from \$30,000 to over \$5 million and varied in duration from two months to more
2 than a year.

3
4 Reduced funding in this program would result in overloading of system components,
5 causing power quality degradation, and resulting in an increased risk of substandard
6 supply conditions with possible equipment failure. In turn, this would lead to customer
7 complaints and more frequent and longer duration interruptions. As well, there is a risk
8 that system protection and co-ordination schemes may be adversely affected, resulting in
9 equipment damage.

11 **2.2 Generation Connections**

12
13 In accordance with its Distribution license, Hydro One Distribution is required to connect
14 new generators that comply with the requirements of the Market Rules, the Distribution
15 System Code, and all applicable codes, standards, and rules. The number of new
16 generators applying for connection, and the potential number that will actually connect,
17 have grown immensely due to the provincial government's initiatives to promote
18 renewable distributed generation, and the resulting procurements implemented by the
19 Ontario Power Authority ("OPA").

20
21 In particular, the previous Renewable Energy Standard Offer Program ("RESOP"), which
22 was placed on hold by the OPA in May 2008, led to about 1,500 applications for
23 Connection Impact Assessments ("CIAs") by the first quarter of 2009. The high number
24 of renewable projects applying to Hydro One Distribution is due to the fact that most of
25 the high potential renewable areas in the province fall within Hydro One Distribution's
26 service territory. Demand for generation connections work has also resulted from the Net
27 Metering program and from load displacement projects, both of which encourage
28 customers to reduce their distribution demand by installing their own generation. Based

1 on experience with the RESOP program, it is expected that demand for generation
2 connections over the test years period will increase as a result of the OPA's impending
3 FIT program.

4
5 Generation Connection expenditures are driven by the number of projects expected to
6 proceed to completion. These projects can vary in terms of size, from small (i.e. less than
7 500 kW) to large (i.e. 10MW to 50MW), and in terms of complexity (e.g. distance to
8 connection point, system upgrade requirements). Forecasting the actual number and type
9 of projects is challenging. As of April 30, 2009, 182 of the 869 projects that have
10 received a CIA have gone on to request a connection estimate and 127 projects have
11 signed a Connection and Cost Recovery Agreement ("CCRA") committing to pay for
12 connection. Table 3 outlines the number of connections completed in 2008 and the
13 numbers forecast for the 2009 through 2011 period. The forecast is based on the number
14 of applications received under the RESOP program, even after the program was placed
15 on hold by the OPA, and makes provisions for demand under the FIT program. It is
16 recognized that the number and type of generation connection applications may change
17 significantly once the GEGEA and all related regulations and programs, such as the FIT
18 program, are implemented.

19
20 **Table 3 – Generation Connections**

21

Category	2008	2009	2010	2011
Large (10MW to 50 MW)	1	0	2	2
Mid-size (500kW to 10 MW)	9	60	132	272
Small (< 500kW)*	0	6	30	30

22 *Excludes 'Micro' generators which are generators that are smaller than 10kW.

23
24 The investments included for Generation Connections cover connection facilities as well
25 as local system improvements required to reliably incorporate generation into the
26 distribution system and avoid negative impacts on other customers. Work may include

1 building a line extension, re-conductoring circuits, installing or upgrading protective
2 devices, and upgrading breakers because of increased short circuit values. On June 5,
3 2009 the Board proposed amendments to the DSC (Proceeding EB-2009-0077). The
4 proposed amendments were subsequently updated by the Board on September 11, 2009.
5 Consistent with the proposed amendments, Hydro One Distribution categorizes this work
6 as follows:

- 7
- 8 1. Connection Assets – Assets used to connect a generation customer to the main
9 distribution system. This includes the assets to connect the facilities on the
10 customer’s property to the distribution system and any isolating devices required
11 (e.g. switches, reclosers).
- 12 2. Expansions – Additions or modifications to the distribution system in response to
13 a request to connect one or more generation facilities. This includes increasing
14 the length of the main distribution system and rebuilding existing lines (i.e. single
15 phase to three phase upgrades, re-conductoring, overbuilding or underbuilding) or
16 voltage conversions.
- 17 3. Renewable Enabling Improvements (“REI”) – Investments made to enhance the
18 system and accommodate increased levels of generation. This includes
19 modifications to manage two way electrical flow, additions of protection
20 equipment and voltage regulating equipment.

21

22 Historically, generators have been responsible for all connection costs resulting in the
23 majority of these costs being recoverable through capital contributions. However, in
24 some cases, the generator may not have been the sole beneficiary of a required system
25 improvement. In these cases, Hydro One Distribution paid for the portion that would
26 benefit other distribution system customers. Benefits typically took the form of
27 replacement of older existing assets with new assets, thereby deferring the date by when
28 these assets would need to be replaced. Going forward, proposed amendments to the

1 DSC issued by the Board on June 5, 2009 and subsequently updated on September 11,
2 2009 (proceeding EB-2009-0077) require that all Connection Assets be paid for by the
3 generator, while Hydro One Distribution will either cover the full cost of an Expansion, if
4 it is part of a Board approved plan, or will cover Expansion costs up to a predefined cap
5 (i.e. \$90,000 per MW) in the case of a specific generator connection not covered by the
6 Board approved plan. REI investments will be the cost responsibility of Hydro One
7 Distribution.

8
9 Work on the Generation Connections program is made up of three sets of expenditures.
10 The first, and largest, set of expenditures is for connecting mid-size generators by
11 expanding the main distribution system, upgrading protections and installing equipment
12 (e.g. reclosers) as necessary. The second set of expenditures is to conduct physical line
13 upgrades (e.g. overbuilding) and conductor transfers to connect generators. Further
14 details on these expenditures are provided in ISDs D27 and D28 at Exhibit D2, Tab 2,
15 Schedule 3. The last set of expenditures are for connecting generators in the net
16 metering, micro (i.e. less than 10 kW), small (i.e. less than 500 kW) and large (i.e. greater
17 than 50 MW) categories. These expenditures also include investments to address power
18 quality (“PQ”), which is an area of concern with generation connections as certain types
19 of generators (e.g. wind) may have a negative impact on Hydro One Distribution’s
20 system. To ensure that power quality issues are appropriately understood and managed,
21 Hydro One Distribution is installing PQ meters in the vicinity of possible wind
22 generation connections to enable monitoring of customer PQ issues in these areas.

23
24 A summary of the costs for each of these areas of expenditures is provided in Table 4.

25

Table 4. Generation Connections Program Costs

\$ Millions	Total Capital Costs		Generator Funded Costs		Externally Funded Costs		Net Capital Costs	
	2010	2011	2010	2011	2010	2011	2010	2011
Mid-size Generation connections	83.2	145.6	12.7	26.1	65.1	108.2	5.4	11.3
Upgrades and Transfers	17.8	16.7	0	0	14.6	13.7	3.2	3.0
Other Generation Connections Work	5.1	4.8	0.7	0.7	3.9	3.6	0.5	0.5
Total	106.0	167.1	13.3	26.8	83.6	125.5	9.1	14.8

As shown in Table 4, the net capital cost included in Hydro One Distribution's Application for the 2010 and 2011 test years is only a small portion of the total capital cost for Generation Connections work. The net capital cost excludes fully recoverable Connection Asset work that will continue to be funded by a generator in accordance with the proposed DSC amendments.

The net capital cost for the Generation Connections program also excludes a large portion of the Expansion and REI investments included in the work shown in Table 4. As discussed in Hydro One Distribution's Green Energy Plan provided at Exhibit A, Tab 14, Schedule 2, investments that enable and promote the growth of renewable energy generation are expected to provide significant benefits to all of Ontario's electricity consumers. As such, Hydro One Distribution believes it is appropriate that the revenue requirement associated with a portion of the capital cost for Expansion and REI investments be recovered from all electricity consumers via an external funding mechanism. Hydro One Distribution recognizes that in some instances these capital investments also provide some benefits to its own customers. Hydro One Distribution's Green Energy Plan details the criteria that have been applied to determine the portion of Expansion and REI investments that are anticipated to provide some benefit to Hydro

1 One customers. This portion of the capital investments is shown as net Capital to be
2 included Hydro One Distribution's rate base, the costs for which are recovered by the
3 rates requested in this Application.

4
5 As detailed above, total gross capital spending on the Generation Connections Program is
6 \$106.0 million and \$167.1 million in 2010 and 2011, respectively. The associated net
7 capital requirements are \$9.1 million and \$14.8 million in 2010 and 2011, respectively.
8 These amounts are greater than historic and bridge year spending as a result of the greater
9 volumes of generation connections anticipated.

11 **2.3 Generation Connection Enhancements**

12
13 This is a new category of investment that commences in 2010 to enable government
14 objectives, as defined in the GEGEA, to shorten connection process times by building the
15 necessary infrastructure for anticipated future renewable generation connections. Hydro
16 One Distribution has identified investment programs to implement shared standardized
17 infrastructure components that will achieve the government objectives at minimum
18 overall cost. These program areas, along with the spending requirements for each in
19 2010 and 2011, are shown in Table 5. These investments include both Expansion and
20 REI work, as defined in the Board's proposed amendments to the DSC. Since renewable
21 generation enabled by Expansion and REI investments are expected to provide significant
22 benefits to all of Ontario's electricity consumers, a portion of the capital cost for these
23 investments will be recovered from all electricity consumers in Ontario via an external
24 funding mechanism. The criteria applied to allocate the benefit of these investments
25 between all electricity consumers in Ontario and its own customers is detailed in the
26 Green Energy Plan provided at Exhibit A, Tab 14, Schedule 2.

Table 5 – Generation Connection Enhancements Program Costs

\$ Millions	Total Capital Costs		Externally Funded Costs		Net Capital Costs	
	2010	2011	2010	2011	2010	2011
Targeted Enhancements to Support Distributed Generation	31.6	87.0	25.9	71.2	5.8	15.8
Station Upgrades for Protection, Control, & Load Rejection	21.1	36.8	19.5	34.1	1.6	2.7
Feeder Control Infrastructure	5.8	4.0	5.8	4.0	0.0	0.0
Wholesale Revenue Metering Modifications	1.7	1.2	1.7	1.2	0.0	0.0
Wireless Telecommunications Stop-Gap	2.1	0	2.1	0.0	0.0	0.0
TOTAL	62.4	129.1	55.0	110.5	7.4	18.6

2.3.1.1 Targeted Enhancements

This investment includes upgrading or expanding the capacity of Distribution Stations, building new express feeders to connect generators, adding breaker positions to connect new feeders from existing Distribution Stations, and upgrading feeder conductors and equipment. These enhancements are designed to accommodate anticipated connections arising from the applications that have been received or are anticipated under the FIT program.

To date Hydro One Distribution has analyzed the 2,300 generator applications that have been received along with those applications that are at advanced stages (i.e. CIA, CCRA). This analysis has been used to determine enhancements that could be undertaken to enable efficient generation connections on the distribution system. Indications are that approximately 360 circuit kilometres of new express feeders, along with other enhancements (e.g. station upgrades, new breaker positions) would be beneficial. Given the objectives of the GEGEA and the direction provided by the Ministry of Energy, Hydro One Distribution fully anticipates undertaking these investments but is awaiting

1 interest generated by the OPA's new FIT program before committing to specific
2 enhancements at specific locations.

3
4 The total gross capital spending requirements for these investments is \$31.6 million and
5 \$87.0 million in 2010 and 2011, respectively. The associated net capital spending re-
6 quirements are \$5.7 million and \$15.8 million in 2010 and 2011, respectively. All of
7 these investments are considered Expansions as defined in the proposed amendments to
8 the DSC. For further details on expenditures for this category of work, please refer to
9 ISD D29 in Exhibit D2, Tab 2, Schedule 3.

10
11 2.3.1.2 Station Upgrades for Protection, Control and Load Rejection

12
13 To allow large numbers of generators to connect to feeders emanating from Distribution
14 Stations without reducing load supply reliability, Hydro One Distribution proposes to
15 make a number enabling improvements including upgrades to protective devices (i.e.
16 station reclosers). The planned upgrades will allow these devices to sense the direction
17 of current feeding into faults, sense the impedance to the fault, and provide coordinating
18 trip signals to appropriate generators to prevent islanding and fuse damage. It will also be
19 necessary to provide load rejection facilities at Distributing Stations to maintain the
20 functionality of Special Protection Schemes and Under Frequency Load Shedding
21 schemes required for the reliability of the Bulk Power System (i.e. Transmission System),
22 Control and monitoring of these new protective systems will be required from Hydro One
23 Distribution's central control centre at the OGCC. Current estimates based on existing
24 generator applications are that 90 station sites will need to be upgraded but as with
25 Targeted Enhancements, specific locations will only be identified after the launch of the
26 FIT program.

27
28 The total gross capital spending requirements for these investments is \$21.1 million and
29 \$36.8 million in 2010 and 2011, respectively. The associated net capital spending

1 requirements for this program are \$1.6 million and \$2.7 million in 2010 and 2011,
2 respectively. These expenditures are considered Renewable Enabling Improvements as
3 defined in the proposed amendments to the DSC. For further details on expenditures for
4 this category of work, please refer to ISD D30 in Exhibit D2, Tab 2, Schedule 3.

5
6 2.3.1.3 Feeder Control Infrastructure

7
8 By design, Hydro One Distribution's feeders have in-line reclosers and voltage
9 regulators. To allow large numbers of generators to connect onto feeders, it is necessary
10 that the in-line reclosers be upgraded to sense the direction of current feeding into faults
11 and in some cases, the impedance to the fault. The reclosers need to send coordinating
12 trip signals to generators and blocking signals to other in-line reclosers, the distributing
13 station or the feeder breakers at the transmission station. In-line voltage regulators need
14 to be upgraded to compensate load flow in both directions and to be able to reset to
15 neutral position during a feeder reclosing operation when generation is tripped. There
16 may also be a need to coordinate the control of in-line voltage regulators with the
17 transmission station voltage controllers to ensure optimal feeder voltages and minimal
18 control action. Current estimates based on existing generator applications are that control
19 infrastructure will need to be installed on 170 regulators and 80 reclosers. As with other
20 enabling improvements, specific locations of installations will be identified after the
21 launch of the FIT program

22
23 The total gross capital spending requirements for these investments is \$5.8 million and
24 \$4.0 million in 2010 and 2011, respectively. There is negligible associated net capital
25 spending for these investments in 2010 and 2011. The criteria discussed in the Green
26 Energy Plan for allocating costs between all electricity consumers in Ontario and Hydro
27 One Distribution customers allocates less than \$50,000 to Hydro One's customers for the
28 remote control components of this program. These expenditures are considered

1 Renewable Enabling Improvements as defined in the proposed amendments to the DSC. |
2 For further details on expenditures for this category of work, please refer to ISD D31 in
3 Exhibit D2, Tab 2, Schedule 3.

4
5 2.3.1.4 Wholesale Revenue Metering Modifications

6
7 Generators will cause reverse flows on Hydro One Distribution's system. In order to
8 ensure correct metering of loads with reverse flows, wholesale revenue metering
9 infrastructure will need to be modified. These modifications include installation of new
10 meters to improve boundary metering with embedded local distribution companies,
11 improvements to allow correct accounting for line losses and possibly modifications to
12 address periods when flows at Transmission stations are reduced below the certified
13 accuracy range of instrument transformers. Estimates based on existing generator
14 applications are that wholesale revenue metering systems at 14 Transmission Stations
15 will need to be modified but as with other enabling improvements, specific locations will
16 not be identified until after the FIT program has been launched.

17
18 The total gross capital spending requirements in 2010 and 2011 for this program are \$1.7
19 million and \$1.2 million respectively. There is no associated net capital spending for
20 these investments in 2010 and 2011. These expenditures are considered Renewable
21 Enabling Improvements as defined in the proposed amendments to the DSC. For further
22 details on expenditures for this category of work, please refer to ISD D32 in Exhibit D2,
23 Tab 2, Schedule 3.

24
25 2.3.1.5 Wireless Telecommunication Stop-Gap

26
27 Communication between feeder protection/control devices and generators is necessary.
28 Hydro One Distribution recognizes that wireless telecommunication holds certain cost

1 advantages over land line for Hydro One's expansive rural service territory. It also avoids
2 the need for neutralizing facilities required when bringing a metallic land line into a
3 Transmission or Distribution station. Hydro One is pursuing a long-range strategy for
4 wide-area wireless coverage using licensed spectrum allocated for WiMax technology.
5 As a stop-gap until that technology is proven and developed to the level of reliability and
6 performance required for utility use, alternate un-licensed spectrum solutions are being
7 implemented to allow lower cost signaling from reclosers and Transmission station
8 feeder breakers to generators. This program funds the required utility-side infrastructure,
9 much of which will be re-usable with the WiMax technology. The generator-end
10 installation is funded by the generators. The total gross capital spending requirement for
11 for this program is \$2.1 million in 2010, and there is no associated net capital spending.
12 Beyond 2010, the expectation is that Wimax technology will be installed and that
13 additional stop-gap installations will not be required.

14
15 For further details on expenditures for this category of work, please refer to ISD D33 in
16 Exhibit D2, Tab 2, Schedule 3.

17 18 **2.4 Wholesale Revenue Metering**

19
20 Wholesale revenue meters ("WRM") are defined in the Market Rules as revenue
21 metering that measures the flow of electricity from the IESO-controlled grid at
22 transformer stations, distribution stations and other points of supply to distribution
23 companies and direct wholesale customers. WRM's are used to settle the purchase of
24 energy, and where the point of supply is directly connected to the IESO-controlled grid,
25 they are used to settle the purchase of transmission services with the IESO administered
26 market.

1 Wholesale meters fall into two categories: those under the transitional arrangement in
2 accordance with the Market Rules and those assigned to Hydro One Distribution for
3 wholesale settlement with the IESO-administered market.

4
5 In accordance with Market Rules, accountability for legacy WRM owned by Hydro One
6 Transmission will move to market participants, including Hydro One Distribution, during
7 the period 2003 to 2008. Since the end of 2008, Hydro One Distribution is responsible
8 for a total of 360 WRMs. This number has changed over time, as a number of meters that
9 were transitioned have been de-registered from the Wholesale Market and are no longer
10 categorized as WRMs.

11
12 In the year accountability is assumed by Hydro One Distribution, the legacy WRM must
13 be upgraded, either fully or partially, to comply with the Market Rules. Partial upgrades
14 at a meter point include the upgrade of meters, and may include upgrades to some, but
15 not all, current and voltage transformers. Measurement Canada and the IESO have made
16 provision for the transition by allowing partial upgrades during the first seal expiry, with
17 remaining non-compliant components to be upgraded at the second seal expiry if not
18 already completed. This capital program funds the cost of the upgrades required at both
19 the 1st and 2nd seal expiry dates.

20
21 The 2010 and 2011 spending requirement for this program is \$7.9 million and \$2.8
22 million, respectively. These expenditures cover the conversion of 39 meters in 2010 and
23 13 in 2011 and align with the schedule set out for WRM conversion driven by the seal
24 expiry date as stipulated by Measurement Canada. Project costs vary from year to year
25 based on volume of meters requiring conversion and on scope of work associated with
26 the particular meter (i.e. partial or full conversion).

27
28 Further details on this program can be found in the ISD in Exhibit D2, Tab 2, Schedule 3.

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2.5 Miscellaneous Connection Charges

There are a number of miscellaneous services Embedded within the capital contributions identified above for Customer Connections and Service Upgrades. The rates for these services are approved and regulated by the Board. The revenues that will be generated from these services are netted from the costs to undertake the work. For details on Miscellaneous Services, please refer to Exhibit G2, Tab 93, Schedule 1.

2.6 Smart Grid

Hydro One is taking a diligent and prudent approach towards its investment plans for Smart Grid (“SG”). This is particularly important given the substantial cost and expert resources required to implement this relatively new concept using systems that have not been previously deployed. Additional complexities also arise due to the requirement that SG enable the distribution system to accommodate larger volumes of distributed generation.

Hydro One has established five value drivers for the SG work - (1) increased reliability, (2) increased operations effectiveness, (3) faster restoration, (4) customer enhancement using smart meter/analytical tools to effect conservation and (5) lower carbon footprint.

Hydro One Distribution’s SG plan builds on the Ontario Government mandated foundations of an intelligent smart meter infrastructure, conservation and demand management (“CDM”) implementation needs and the integration of renewable distributed generation into the distribution system. In order to understand how these smart grid value drivers can best be achieved, Hydro One will proceed with a “Smart Zone” pilot area in Owen Sound to test new technologies and systems prior to recommending a

1 corporate-wide deployment. The Smart Zone work will be implemented through a
2 combination of work performed by Hydro One Distribution staff and external service
3 providers. The main objective of this initiative is to innovate, test and prove new and
4 emerging technologies. This will permit Hydro One to proactively define and implement
5 measures that will eventually transform the current distribution system into a Smart Grid
6 by making appropriate capital investments, asset solutions, standards and/or replacement
7 strategies. Spending on the Owen Sound Smart Zone Pilot is forecast to cost \$12.5
8 million in 2010 and \$42.8 million in 2011.

9
10 Examples of the types of pilot project investments that will be implemented in the Smart
11 Zone include:

- 12 a) acquisition of “smart devices” such as real time monitoring and control
13 devices, SCADA, In-home Energy Displays, and other automated field
14 devices needed to demonstrate proposed technologies;
- 15 b) acquisition of systems integration technologies (both real-time and enterprise
16 applications) that monitor, control and remediate faults, outage
17 management/restoration systems, Geographical Information Systems (“GIS”)
18 technology, Energy Storage devices such as battery and Compressed Air
19 Energy Storage, as well as stationary power systems such as hydrogen fuel
20 cells that can be used to power Smart Zone station services;
- 21 c) deployment for proving both technology and inter-operability of technologies,
22 as well as business benefits which will drive further adoption in other areas of
23 Hydro One’s networks;
- 24 d) development of operating procedures and training materials.

25
26 As part of the Owen Sound Smart Zone work, and in alignment with its broader SG plan,
27 Hydro One Distribution also plans to run a Plug-in Hybrid Electric Vehicles (“PHEV”)

1 field trial with third party collaboration, as well as implementing CDM Controllers and
2 smart appliance interfaces.

3
4 Expenditures will also be required to add or update IT systems (e.g. Distribution
5 Management Systems and Operational Data Store) and the associated interfaces and
6 event management software. Given the challenges associated with the IT infrastructure
7 required to support a SG, the Company will undertake work to assess and develop an IT
8 security plan for safe, secure and reliable operation of the grid.

9
10 In addition, Hydro One Distribution is working on a RFP to seek interest from vendors to
11 participate in SG pilot investments. The RFP is divided into several phases:

- 12 • Phase 0 (2009/2010) – Project Definition and Setup. This will include a project
13 governance plan, a statement of work for phase 1, a business case template, and a
14 detailed phase 1 integrated plan including design, materials and resources.
- 15 • Phase 1 (2010/2011) – Implementation in the “Smart Zone”. This will be seen as
16 the live “proving ground” for Smart Grid development over coming years; a
17 platform on which proponents can demonstrate the viability and value of their
18 solutions.
- 19 • Phase 2 (2012-2015) – Full Implementation (province-wide roll-out) of Smart
20 Grid. This is the enterprise roll-out of successful solutions conceived and
21 developed in Phase 0, and proven through implementation in Phase 1, to the rest
22 of the Hydro One Distribution’s service territory.

23
24 The 2010 and 2011 spending requirements for the Smart Grid program are \$20.8 million
25 and \$49.9 million, respectively. Further details on this program can be found in the ISD
26 D35 provided in Exhibit D2, Tab 2, Schedule 3.