

Undertaking #121: Mr. Dunsky to provide supporting tables for the information found in Figure 15 of his pre-filed written evidence relating to grid parity, and it will address the conclusions drawn for Ontario, Minnesota, North Dakota, Saskatchewan, and Manitoba.

Response:

Please see the attached memo, prepared by Mr. Dunsky and his colleague Marina Malkova:

- *Solar PV and Grid Parity for Manitoba and Neighbouring Regions: Key Assumptions and Detailed Results.*

SOLAR PV AND GRID PARITY FOR MANITOBA AND NEIGHBOURING REGIONS *KEY ASSUMPTIONS AND DETAILED RESULTS*

MEMO

prepared by Philippe Dunsky and Marina Malkova

FOR

MANITOBA PUBLIC UTILITIES BOARD'S

NEED FOR AND ALTERNATIVES TO (NFAT) PROCEEDINGS

May 2ND, 2014



ABOUT DUNSKY ENERGY CONSULTING

Dunsky Energy Consulting is a Canadian firm specialized in the design, analysis, evaluation, and technical and strategic support of demand-side management strategies. Our clients include leading utilities, government agencies, private firms and non-profit organizations throughout North America.

CLIENTS (partial list)

EXPERTISE

- ▶ Energy Efficiency and Demand-Side Management
- ▶ Renewable Energy and Emerging Technologies
- ▶ Greenhouse Gas Reductions

SERVICES

- ▶ Design and evaluation of programs, plans and policies
- ▶ Strategic, regulatory and analytical support
- ▶ New opportunities assessments

CLIENTELE

- ▶ Utilities
- ▶ Governments
- ▶ Solution Providers
- ▶ Large consumers
- ▶ Non-profits

To learn more, please visit us at www.dunsky.ca.

INTRODUCTION

At the request of the Manitoba Public Utilities Board, we have prepared this memo to provide further details on the “grid parity” assessment that we presented in Mr. Dunsky’s written testimony of February 3rd, 2014, and again during oral testimony on April 24th, 2014.

The grid parity analysis of distributed solar generation aims to determine the point at which, from a homeowner perspective, the installed cost of rooftop solar PV becomes less expensive, on an annualized basis and including financing costs, than the purchase cost of the electricity it saves. Specifically, this compares evolving residential, grid-supplied electricity rates (and associated taxes) with the levelized cost of solar power generation for the customer over a system’s lifetime.

The analysis we conducted for the Manitoba NFAT hearing covers the period 2013 to 2034, and the following five regions: Manitoba (MB), Saskatchewan (SK), Ontario (ON), Minnesota (MN) and North Dakota (ND).

Below we provide more specific information pertaining to:

1. **Solar LCOE Algorithm:** how the levelized cost of energy, i.e. the fully-financed cost of solar PV on a ¢/kWh basis, is calculated
2. **Key Assumptions:** key assumptions used for purposes of the analysis
3. **Results:** detailed results presented for each of the 3 provinces and 2 states

We welcome the opportunity to discuss further should you have any questions or comments.

LEVELIZED COST OF ENERGY (LCOE) CALCULATION

The Levelized Cost of Energy, according to the generating customer's perspective, represents the customer's total solar investment as a per-kWh cost of electric energy supply which can be compared to the retail electric rate. This is effectively the anticipated cost for a customer who chooses to finance their system over the system's useful life, including interest. It is calculated according to the following formula¹:

$$LCOE = \frac{\sum_{t=0}^T \frac{I_t + O_t + M_t + F_t}{(1+r)^t}}{\sum_{t=0}^T \frac{S_t \times (1-d)^t}{(1+r)^t}}$$

where:

T = equipment useful lifetime

I = total investment for the homeowner, including incentives and taxes

O = cost of operation (including inverters)

M = cost of maintenance

F = cost of financing

S = rated energy output by year

d = degradation factor

r = discount rate

Thus, the present value of all net costs necessary to install and operate the system corresponds to the present value of the LCOE multiplied by the amount of generated energy over the system's lifetime.

¹ A review of solar photovoltaic levelized cost of electricity, K. Brankera, M.J.M. Pathaka, J.M. Pearce (2011) – see <http://www.sjsu.edu/people/dustin.mulvaney/courses/envs116/s1/Branker2011Renewable%20and%20Sustainable%20Energy%20Reviews.pdf>.

ASSUMPTIONS

This section presents the key assumptions used in this analysis, including typical system specifications, system cost including available incentives and maintenance expenses, financing conditions and electric rates.

► SYSTEM SPECIFICATIONS

The technical system specifications of a typical residential system are presented in the table below.

Table 1 System specifications

RATED SIZE	kW	5
DEGRADATION RATE	%/yr	0.50%
SYSTEM LIFETIME	yrs	30
INVERTER LIFETIME	yrs	10

The capacity factor for each system depends on the amount of system losses and the amount of insolation the panels can be expected to receive at a given location. This figure is expressed in this analysis as the PV potential in kWh/kW as evaluated by RETScreen for each of the five analyzed regions assuming that panels will be south-facing with a tilt of -15°. These account for the Global Solar Radiation, or GSR, specific to each region.

Table 2 PV Potential by region

REGION	PROXY CITY	SOLAR RADIATION (KWH/KW/YR)
MANITOBA	Winnipeg	1278
SASKATCHEWAN	Saskatoon	1341
ONTARIO	Ottawa	1198
MINNESOTA	Saskatoon	1278
NORTH DAKOTA	Saskatoon	1278

► **SYSTEM COST**

The system cost, excluding incentives and taxes, and their expected evolution for the High cost and Low cost scenarios are presented in the table below. These scenarios represent the variance in quoted solar system prices on the market today, as well as forecasts of future cost reductions due to scale, automation, and other continuous improvements.

Table 3 System costs

		HIGH COST SCENARIO	LOW COST SCENARIO
INSTALLED SYSTEM COST PER WATT IN 2013	\$/W	4.50	3.50
ANNUAL INSTALLED SYSTEM COST DECREASE	%	5%	15%
INSTALLED SYSTEM COST	\$	22,500	17,500
PV INVERTER REPLACEMENT COST FOR REPLACEMENTS AT YRS 10 & 20	\$/W	0.4	0.4
PRESENT VALUE OF INVERTER REPLACEMENT COSTS	\$	1,982	1,982

Note that our analysis uses a 5% discount rate. From a customer perspective, this should be representative of either the value of their capital, or the rate at which they could borrow (e.g. through a HELOC) over the long term.

The current rebates, feed-in tariffs and federal tax-credit applicable on residential solar system installations are listed in Table 4. It has been assumed that all incentives (with exception of the tax credit) will be gradually phased out over a period of ten years starting in 2015.

Table 4 Rebates and incentives

		MB	SK	ON	MN	ND
2013 UTILITY REBATE ON INSTALLED COST	% HIGH	--	20%	--	33.33%	--
	% LOW		20%		42.86%	
2013 FEED-IN TARIFF	\$/kWh	--	--	0.40	--	--
2013 FEDERAL TAX CREDIT ON REBATED COSTS	%	--	--	--	30.00%	30.00%
INCENTIVE DECLINE RATE, STARTING 2015	%	--	10%	10%	10%	10%
SALES TAX ON EQUIPMENT (ASSUMED CHARGED ON PRE-REBATE PRICE)	%	13%	10%	0%	0%	13%
2013 INSTALLED SYSTEM COST INCLUDING INCENTIVES AND TAX	\$ HIGH	25,425	20,250	22,500	10,500	15,750
	\$ LOW	19,775	15,750	17,500	7,000	12,250

The regional electricity rates used for this analysis as well as the projected annual rate of increase are listed in Table 5. It is assumed that the rate of increase will remain constant over the lifetime of the system.

Table 5 Electricity rates

REGION	2013 RESIDENTIAL RATE (\$)²	CURRENT ANNUAL RATE INCREASE PROJECTIONS (%)
MANITOBA HYDRO	0.08	4.30%
SASK POWER	0.13	5.00%
OPA	0.12	3.50%
MINNESOTA (XCEL)	0.12	4.34%
NORTH DAKOTA (XCEL)	0.09	4.44%

² Sourced from Manitoba Hydro, the Ontario Energy Board, Ontario Finance ministry, SaskPower, and the US Energy Information Administration.

RESULTS

The following tables list the results obtained for the LCOE calculation as outlined in Section 1 with the above inputs for each region, for both High and Low solar cost scenarios. Each table also presents the comparable residential rate for purchasing power from the grid, as well as the difference between the two, indicating the point at which “grid parity” is anticipated.

It is worth noting that this analysis is for the Residential sector only. As installed solar PV costs can be significantly lower with larger-scale installations, parity will tend to arrive earlier for non-residential customers, as well as for grid-scale, utility-driven PV farms.

Table 6 Solar LCOE versus Power Rates in Manitoba (incl. taxes)

MB	HIGH COST			LOW COST		
	RATE	SOLAR LCOE	Δ LCOE - RATE	RATE	SOLAR LCOE	Δ LCOE - RATE
YEAR	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh
2013	0.09 \$	0.26 \$	(0.18 \$)	0.09 \$	0.21 \$	(0.12 \$)
2014	0.09 \$	0.25 \$	(0.16 \$)	0.09 \$	0.18 \$	(0.09 \$)
2015	0.09 \$	0.24 \$	(0.14 \$)	0.09 \$	0.16 \$	(0.06 \$)
2016	0.10 \$	0.23 \$	(0.13 \$)	0.10 \$	0.13 \$	(0.04 \$)
2017	0.10 \$	0.22 \$	(0.11 \$)	0.10 \$	0.12 \$	(0.02 \$)
2018	0.11 \$	0.21 \$	(0.10 \$)	0.11 \$	0.10 \$	(0.00 \$)
2019	0.11 \$	0.20 \$	(0.09 \$)	0.11 \$	0.09 \$	0.02 \$
2020	0.12 \$	0.19 \$	(0.07 \$)	0.12 \$	0.08 \$	0.04 \$
2021	0.12 \$	0.18 \$	(0.06 \$)	0.12 \$	0.08 \$	0.04 \$
2022	0.13 \$	0.17 \$	(0.05 \$)	0.13 \$	0.07 \$	0.05 \$
2023	0.13 \$	0.16 \$	(0.03 \$)	0.13 \$	0.07 \$	0.06 \$
2024	0.14 \$	0.16 \$	(0.02 \$)	0.14 \$	0.07 \$	0.07 \$
2025	0.14 \$	0.15 \$	(0.01 \$)	0.14 \$	0.07 \$	0.08 \$
2026	0.15 \$	0.14 \$	(0.01 \$)	0.15 \$	0.06 \$	0.09 \$
2027	0.16 \$	0.14 \$	0.02 \$	0.16 \$	0.06 \$	0.09 \$
2028	0.16 \$	0.13 \$	0.03 \$	0.16 \$	0.06 \$	0.10 \$
2029	0.17 \$	0.13 \$	0.04 \$	0.17 \$	0.06 \$	0.11 \$
2030	0.18 \$	0.12 \$	0.06 \$	0.18 \$	0.06 \$	0.12 \$
2031	0.18 \$	0.12 \$	0.07 \$	0.18 \$	0.05 \$	0.13 \$
2032	0.19 \$	0.11 \$	0.08 \$	0.19 \$	0.05 \$	0.14 \$
2033	0.20 \$	0.11 \$	0.09 \$	0.20 \$	0.05 \$	0.15 \$
2034	0.21 \$	0.10 \$	0.11 \$	0.21 \$	0.05 \$	0.16 \$
2035	0.22 \$	0.10 \$	0.12 \$	0.22 \$	0.05 \$	0.17 \$
2036	0.23 \$	0.09 \$	0.13 \$	0.23 \$	0.05 \$	0.18 \$
2037	0.24 \$	0.09 \$	0.15 \$	0.24 \$	0.04 \$	0.19 \$
2038	0.25 \$	0.09 \$	0.16 \$	0.25 \$	0.04 \$	0.20 \$
2039	0.26 \$	0.08 \$	0.17 \$	0.26 \$	0.04 \$	0.22 \$
2040	0.27 \$	0.08 \$	0.19 \$	0.27 \$	0.04 \$	0.23 \$
2041	0.28 \$	0.08 \$	0.20 \$	0.28 \$	0.04 \$	0.24 \$
2042	0.29 \$	0.07 \$	0.22 \$	0.29 \$	0.04 \$	0.25 \$
2043	0.30 \$	0.07 \$	0.23 \$	0.30 \$	0.04 \$	0.27 \$

Table 7 Solar LCOE versus Power Rates in Saskatchewan (incl. taxes)

SK	HIGH COST			LOW COST		
	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>
YEAR	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh
2013	0.14 \$	0.20 \$	(0.06 \$)	0.14 \$	0.16 \$	(0.02 \$)
2014	0.15 \$	0.19 \$	(0.04 \$)	0.15 \$	0.14 \$	0.01 \$
2015	0.16 \$	0.19 \$	(0.03 \$)	0.16 \$	0.12 \$	0.04 \$
2016	0.17 \$	0.18 \$	(0.02 \$)	0.17 \$	0.11 \$	0.06 \$
2017	0.18 \$	0.18 \$	(0.00 \$)	0.18 \$	0.10 \$	0.08 \$
2018	0.18 \$	0.17 \$	0.01 \$	0.18 \$	0.09 \$	0.10 \$
2019	0.19 \$	0.17 \$	0.03 \$	0.19 \$	0.08 \$	0.12 \$
2020	0.20 \$	0.16 \$	0.04 \$	0.20 \$	0.07 \$	0.13 \$
2021	0.21 \$	0.16 \$	0.05 \$	0.21 \$	0.07 \$	0.15 \$
2022	0.22 \$	0.15 \$	0.07 \$	0.22 \$	0.07 \$	0.16 \$
2023	0.24 \$	0.15 \$	0.09 \$	0.24 \$	0.07 \$	0.17 \$
2024	0.25 \$	0.15 \$	0.10 \$	0.25 \$	0.06 \$	0.18 \$
2025	0.26 \$	0.14 \$	0.12 \$	0.26 \$	0.06 \$	0.20 \$
2026	0.27 \$	0.13 \$	0.14 \$	0.27 \$	0.06 \$	0.21 \$
2027	0.29 \$	0.13 \$	0.16 \$	0.29 \$	0.06 \$	0.23 \$
2028	0.30 \$	0.12 \$	0.18 \$	0.30 \$	0.06 \$	0.25 \$
2029	0.32 \$	0.12 \$	0.20 \$	0.32 \$	0.05 \$	0.26 \$
2030	0.33 \$	0.11 \$	0.22 \$	0.33 \$	0.05 \$	0.28 \$
2031	0.35 \$	0.11 \$	0.24 \$	0.35 \$	0.05 \$	0.30 \$
2032	0.37 \$	0.10 \$	0.26 \$	0.37 \$	0.05 \$	0.32 \$
2033	0.38 \$	0.10 \$	0.28 \$	0.38 \$	0.05 \$	0.34 \$
2034	0.40 \$	0.09 \$	0.31 \$	0.40 \$	0.05 \$	0.36 \$
2035	0.42 \$	0.09 \$	0.33 \$	0.42 \$	0.04 \$	0.38 \$
2036	0.44 \$	0.09 \$	0.36 \$	0.44 \$	0.04 \$	0.40 \$
2037	0.47 \$	0.08 \$	0.38 \$	0.47 \$	0.04 \$	0.43 \$
2038	0.49 \$	0.08 \$	0.41 \$	0.49 \$	0.04 \$	0.45 \$
2039	0.51 \$	0.08 \$	0.44 \$	0.51 \$	0.04 \$	0.48 \$
2040	0.54 \$	0.07 \$	0.47 \$	0.54 \$	0.04 \$	0.50 \$
2041	0.57 \$	0.07 \$	0.50 \$	0.57 \$	0.04 \$	0.53 \$
2042	0.60 \$	0.07 \$	0.53 \$	0.60 \$	0.04 \$	0.56 \$
2043	0.63 \$	0.07 \$	0.56 \$	0.63 \$	0.04 \$	0.59 \$

Table 8 Solar LCOE versus Power Rates in Ontario (incl. taxes)

ON	HIGH COST			LOW COST		
	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>
YEAR	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh
2013	0.14 \$	0.08 \$	0.06 \$	0.14 \$	0.03 \$	0.11 \$
2014	0.14 \$	0.08 \$	0.07 \$	0.14 \$	0.01 \$	0.13 \$
2015	0.15 \$	0.09 \$	0.06 \$	0.15 \$	0.01 \$	0.14 \$
2016	0.16 \$	0.10 \$	0.06 \$	0.16 \$	0.01 \$	0.15 \$
2017	0.16 \$	0.11 \$	0.05 \$	0.16 \$	0.01 \$	0.15 \$
2018	0.17 \$	0.11 \$	0.05 \$	0.17 \$	0.02 \$	0.15 \$
2019	0.17 \$	0.12 \$	0.05 \$	0.17 \$	0.02 \$	0.15 \$
2020	0.18 \$	0.13 \$	0.05 \$	0.18 \$	0.03 \$	0.15 \$
2021	0.18 \$	0.14 \$	0.05 \$	0.18 \$	0.04 \$	0.15 \$
2022	0.19 \$	0.14 \$	0.05 \$	0.19 \$	0.05 \$	0.14 \$
2023	0.20 \$	0.15 \$	0.05 \$	0.20 \$	0.06 \$	0.14 \$
2024	0.20 \$	0.15 \$	0.05 \$	0.20 \$	0.07 \$	0.14 \$
2025	0.21 \$	0.14 \$	0.07 \$	0.21 \$	0.06 \$	0.15 \$
2026	0.22 \$	0.14 \$	0.08 \$	0.22 \$	0.06 \$	0.16 \$
2027	0.23 \$	0.13 \$	0.09 \$	0.23 \$	0.06 \$	0.17 \$
2028	0.23 \$	0.13 \$	0.11 \$	0.23 \$	0.06 \$	0.18 \$
2029	0.24 \$	0.12 \$	0.12 \$	0.24 \$	0.06 \$	0.19 \$
2030	0.25 \$	0.12 \$	0.14 \$	0.25 \$	0.05 \$	0.20 \$
2031	0.26 \$	0.11 \$	0.15 \$	0.26 \$	0.05 \$	0.21 \$
2032	0.27 \$	0.11 \$	0.16 \$	0.27 \$	0.05 \$	0.22 \$
2033	0.28 \$	0.10 \$	0.18 \$	0.28 \$	0.05 \$	0.23 \$
2034	0.29 \$	0.10 \$	0.19 \$	0.29 \$	0.05 \$	0.24 \$
2035	0.30 \$	0.09 \$	0.20 \$	0.30 \$	0.05 \$	0.25 \$
2036	0.31 \$	0.09 \$	0.22 \$	0.31 \$	0.05 \$	0.26 \$
2037	0.32 \$	0.09 \$	0.23 \$	0.32 \$	0.04 \$	0.28 \$
2038	0.33 \$	0.08 \$	0.25 \$	0.33 \$	0.04 \$	0.29 \$
2039	0.34 \$	0.08 \$	0.26 \$	0.34 \$	0.04 \$	0.30 \$
2040	0.35 \$	0.08 \$	0.28 \$	0.35 \$	0.04 \$	0.31 \$
2041	0.37 \$	0.07 \$	0.29 \$	0.37 \$	0.04 \$	0.33 \$
2042	0.38 \$	0.07 \$	0.31 \$	0.38 \$	0.04 \$	0.34 \$
2043	0.39 \$	0.07 \$	0.32 \$	0.39 \$	0.04 \$	0.36 \$

Table 9 Solar LCOE versus Power Rates in Minnesota (incl. taxes)

MN	HIGH COST			LOW COST		
	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>
YEAR	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh
2013	0.13 \$	0.12 \$	0.01 \$	0.13 \$	0.09 \$	0.04 \$
2014	0.13 \$	0.11 \$	0.02 \$	0.13 \$	0.07 \$	0.07 \$
2015	0.14 \$	0.11 \$	0.03 \$	0.14 \$	0.06 \$	0.08 \$
2016	0.15 \$	0.12 \$	0.03 \$	0.15 \$	0.06 \$	0.09 \$
2017	0.15 \$	0.12 \$	0.03 \$	0.15 \$	0.06 \$	0.09 \$
2018	0.16 \$	0.12 \$	0.04 \$	0.16 \$	0.06 \$	0.10 \$
2019	0.16 \$	0.12 \$	0.04 \$	0.16 \$	0.06 \$	0.11 \$
2020	0.17 \$	0.13 \$	0.05 \$	0.17 \$	0.05 \$	0.12 \$
2021	0.18 \$	0.13 \$	0.05 \$	0.18 \$	0.06 \$	0.12 \$
2022	0.19 \$	0.13 \$	0.05 \$	0.19 \$	0.06 \$	0.13 \$
2023	0.20 \$	0.14 \$	0.06 \$	0.20 \$	0.06 \$	0.13 \$
2024	0.20 \$	0.14 \$	0.06 \$	0.20 \$	0.06 \$	0.14 \$
2025	0.21 \$	0.14 \$	0.08 \$	0.21 \$	0.06 \$	0.15 \$
2026	0.22 \$	0.13 \$	0.09 \$	0.22 \$	0.06 \$	0.16 \$
2027	0.23 \$	0.12 \$	0.11 \$	0.23 \$	0.06 \$	0.18 \$
2028	0.24 \$	0.12 \$	0.12 \$	0.24 \$	0.05 \$	0.19 \$
2029	0.25 \$	0.11 \$	0.14 \$	0.25 \$	0.05 \$	0.20 \$
2030	0.26 \$	0.11 \$	0.15 \$	0.26 \$	0.05 \$	0.21 \$
2031	0.27 \$	0.10 \$	0.17 \$	0.27 \$	0.05 \$	0.23 \$
2032	0.29 \$	0.10 \$	0.19 \$	0.29 \$	0.05 \$	0.24 \$
2033	0.30 \$	0.10 \$	0.20 \$	0.30 \$	0.05 \$	0.25 \$
2034	0.31 \$	0.09 \$	0.22 \$	0.31 \$	0.05 \$	0.27 \$
2035	0.33 \$	0.09 \$	0.24 \$	0.33 \$	0.04 \$	0.28 \$
2036	0.34 \$	0.09 \$	0.25 \$	0.34 \$	0.04 \$	0.30 \$
2037	0.35 \$	0.08 \$	0.27 \$	0.35 \$	0.04 \$	0.31 \$
2038	0.37 \$	0.08 \$	0.29 \$	0.37 \$	0.04 \$	0.33 \$
2039	0.39 \$	0.08 \$	0.31 \$	0.39 \$	0.04 \$	0.35 \$
2040	0.40 \$	0.07 \$	0.33 \$	0.40 \$	0.04 \$	0.36 \$
2041	0.42 \$	0.07 \$	0.35 \$	0.42 \$	0.04 \$	0.38 \$
2042	0.44 \$	0.07 \$	0.37 \$	0.44 \$	0.04 \$	0.40 \$
2043	0.46 \$	0.07 \$	0.39 \$	0.46 \$	0.04 \$	0.42 \$

Table 10 Solar LCOE versus Power Rates in North Dakota (incl. taxes)

ND	HIGH COST			LOW COST		
	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>	<u>RATE</u>	<u>SOLAR LCOE</u>	<u>Δ LCOE - RATE</u>
YEAR	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kWh
2013	0.10 \$	0.17 \$	(0.07 \$)	0.10 \$	0.14 \$	(0.03 \$)
2014	0.11 \$	0.16 \$	(0.06 \$)	0.11 \$	0.12 \$	(0.01 \$)
2015	0.11 \$	0.16 \$	(0.05 \$)	0.11 \$	0.11 \$	0.00 \$
2016	0.12 \$	0.16 \$	(0.04 \$)	0.12 \$	0.10 \$	0.02 \$
2017	0.12 \$	0.16 \$	(0.04 \$)	0.12 \$	0.09 \$	0.03 \$
2018	0.13 \$	0.16 \$	(0.03 \$)	0.13 \$	0.08 \$	0.05 \$
2019	0.13 \$	0.15 \$	(0.02 \$)	0.13 \$	0.07 \$	0.06 \$
2020	0.14 \$	0.15 \$	(0.01 \$)	0.14 \$	0.07 \$	0.07 \$
2021	0.14 \$	0.15 \$	(0.00 \$)	0.14 \$	0.07 \$	0.08 \$
2022	0.15 \$	0.15 \$	0.00 \$	0.15 \$	0.06 \$	0.09 \$
2023	0.16 \$	0.14 \$	0.01 \$	0.16 \$	0.06 \$	0.09 \$
2024	0.16 \$	0.14 \$	0.02 \$	0.16 \$	0.06 \$	0.10 \$
2025	0.17 \$	0.14 \$	0.04 \$	0.17 \$	0.06 \$	0.11 \$
2026	0.18 \$	0.13 \$	0.05 \$	0.18 \$	0.06 \$	0.12 \$
2027	0.19 \$	0.12 \$	0.06 \$	0.19 \$	0.06 \$	0.13 \$
2028	0.20 \$	0.12 \$	0.08 \$	0.20 \$	0.05 \$	0.14 \$
2029	0.20 \$	0.11 \$	0.09 \$	0.20 \$	0.05 \$	0.15 \$
2030	0.21 \$	0.11 \$	0.11 \$	0.21 \$	0.05 \$	0.16 \$
2031	0.22 \$	0.10 \$	0.12 \$	0.22 \$	0.05 \$	0.17 \$
2032	0.23 \$	0.10 \$	0.13 \$	0.23 \$	0.05 \$	0.19 \$
2033	0.24 \$	0.10 \$	0.15 \$	0.24 \$	0.05 \$	0.20 \$
2034	0.25 \$	0.09 \$	0.16 \$	0.25 \$	0.05 \$	0.21 \$
2035	0.27 \$	0.09 \$	0.18 \$	0.27 \$	0.04 \$	0.22 \$
2036	0.28 \$	0.09 \$	0.19 \$	0.28 \$	0.04 \$	0.24 \$
2037	0.29 \$	0.08 \$	0.21 \$	0.29 \$	0.04 \$	0.25 \$
2038	0.30 \$	0.08 \$	0.22 \$	0.30 \$	0.04 \$	0.26 \$
2039	0.32 \$	0.08 \$	0.24 \$	0.32 \$	0.04 \$	0.28 \$
2040	0.33 \$	0.07 \$	0.26 \$	0.33 \$	0.04 \$	0.29 \$
2041	0.34 \$	0.07 \$	0.27 \$	0.34 \$	0.04 \$	0.31 \$
2042	0.36 \$	0.07 \$	0.29 \$	0.36 \$	0.04 \$	0.32 \$
2043	0.38 \$	0.07 \$	0.31 \$	0.38 \$	0.04 \$	0.34 \$



50 Ste-Catherine St. West, suite 420, Montreal, Québec, Canada H2X 3V4 | T. 514.504.9030 | F. 514.289.2665 | info@dunsky.ca

www.dunsky.ca