

CGC 2015

Experiences with Artificial Lighting in Commercial Greenhouse Vegetable Production

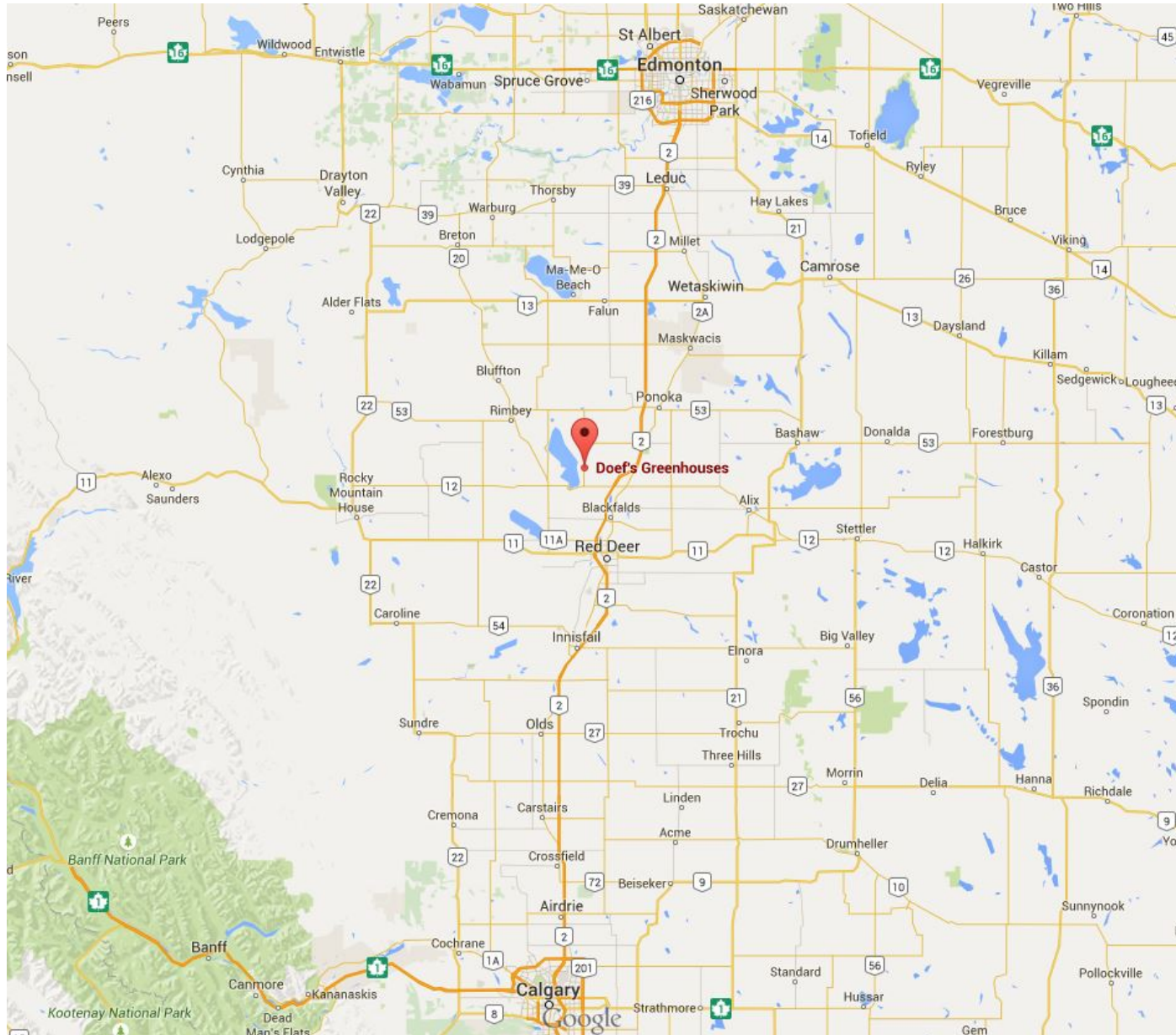
Eric Doef – Doef's Greenhouses Ltd.
Lacombe County, Alberta, Canada

doefsgreenhouses.com

@doefs



Where are we?



Doef's Greenhouses Ltd. History























Doef's Greenhouses Ltd. Products



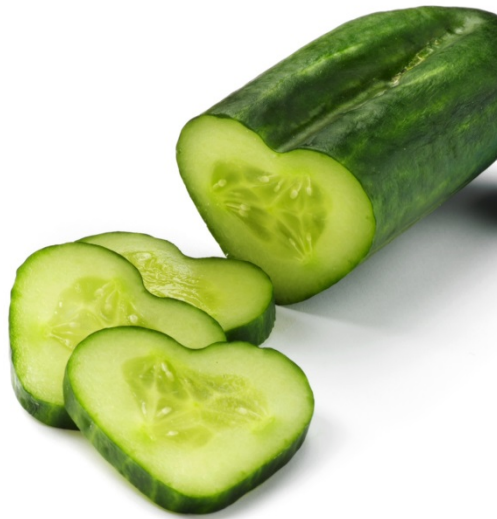














Doef's Greenhouses Ltd. Marketing









PIK-N-PAK

Lacombe, Alberta

PRODUCE Ltd.



piknpakproduce.com

[@piknpakproduce](https://twitter.com/piknpakproduce)

Fresh Locally Grown Greenhouse Vegetables

EGGPLANT
EACH
2.29
VALUE PRICED
Every Day!

Localize



home



about us



our products



local is better



healthy eating



community



careers



contact us

Doef's Greenhouses Ltd. Lighting Experiences



Lighting Installation Details:



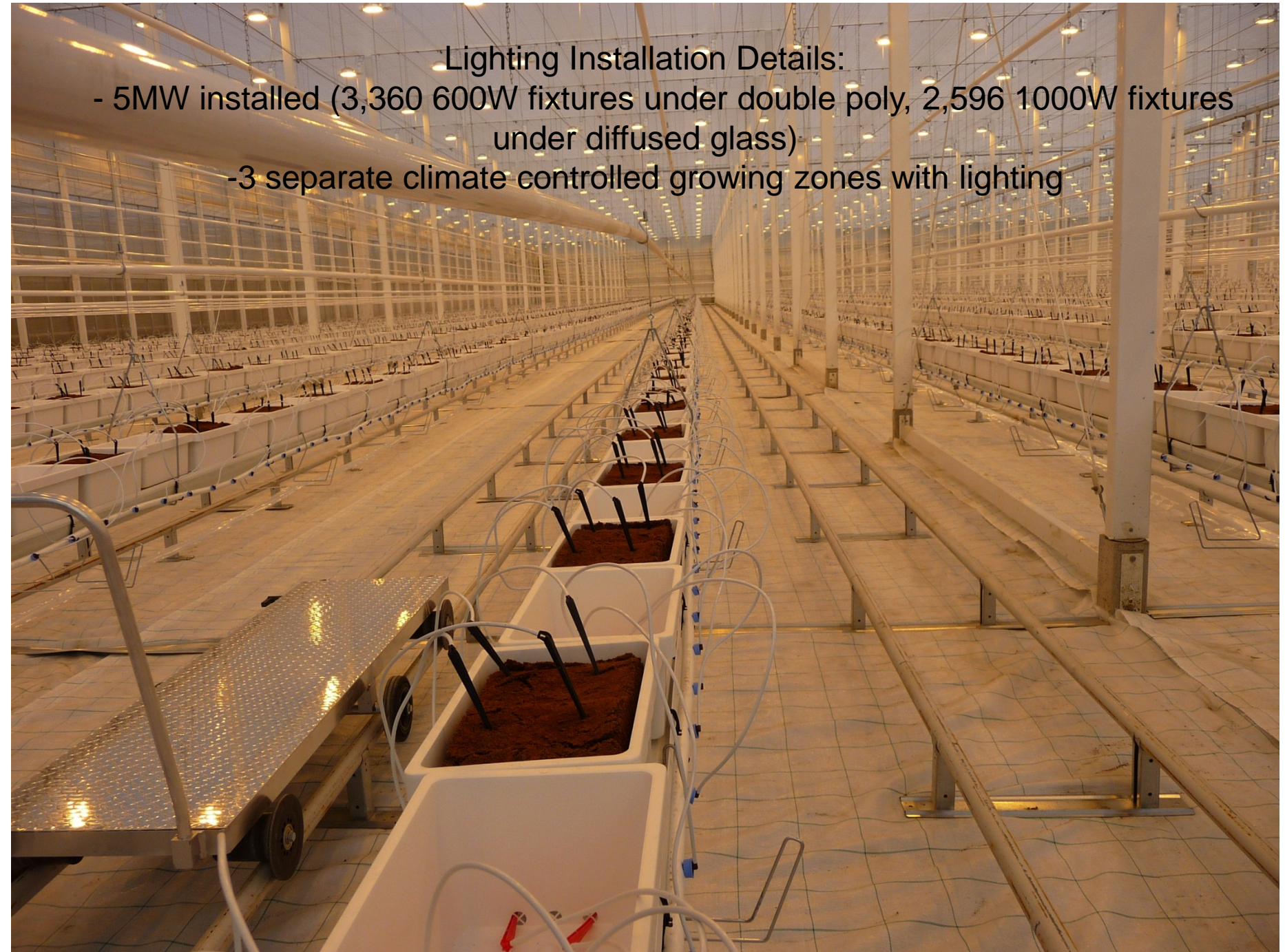
Lighting Installation Details:

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- 3 separate climate controlled growing zones with lighting



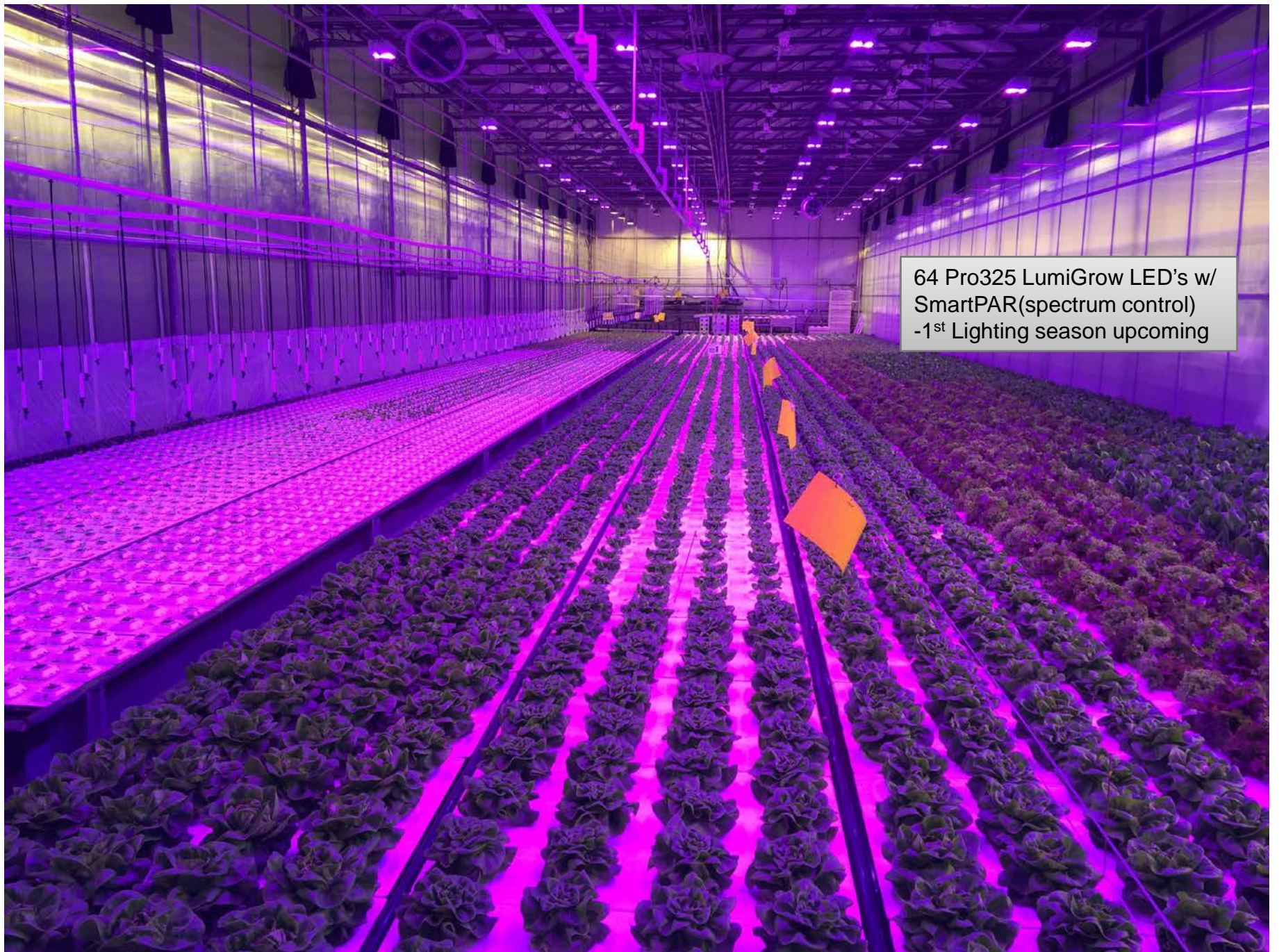
Lighting Installation Details:

- 5MW installed (3,360 600W fixtures under double poly, 2,596 1000W fixtures under diffused glass)
- 3 separate climate controlled growing zones with lighting
- upcoming lighting season: high wire cucumbers(long and short), bell peppers, various types of tomatoes, lettuce

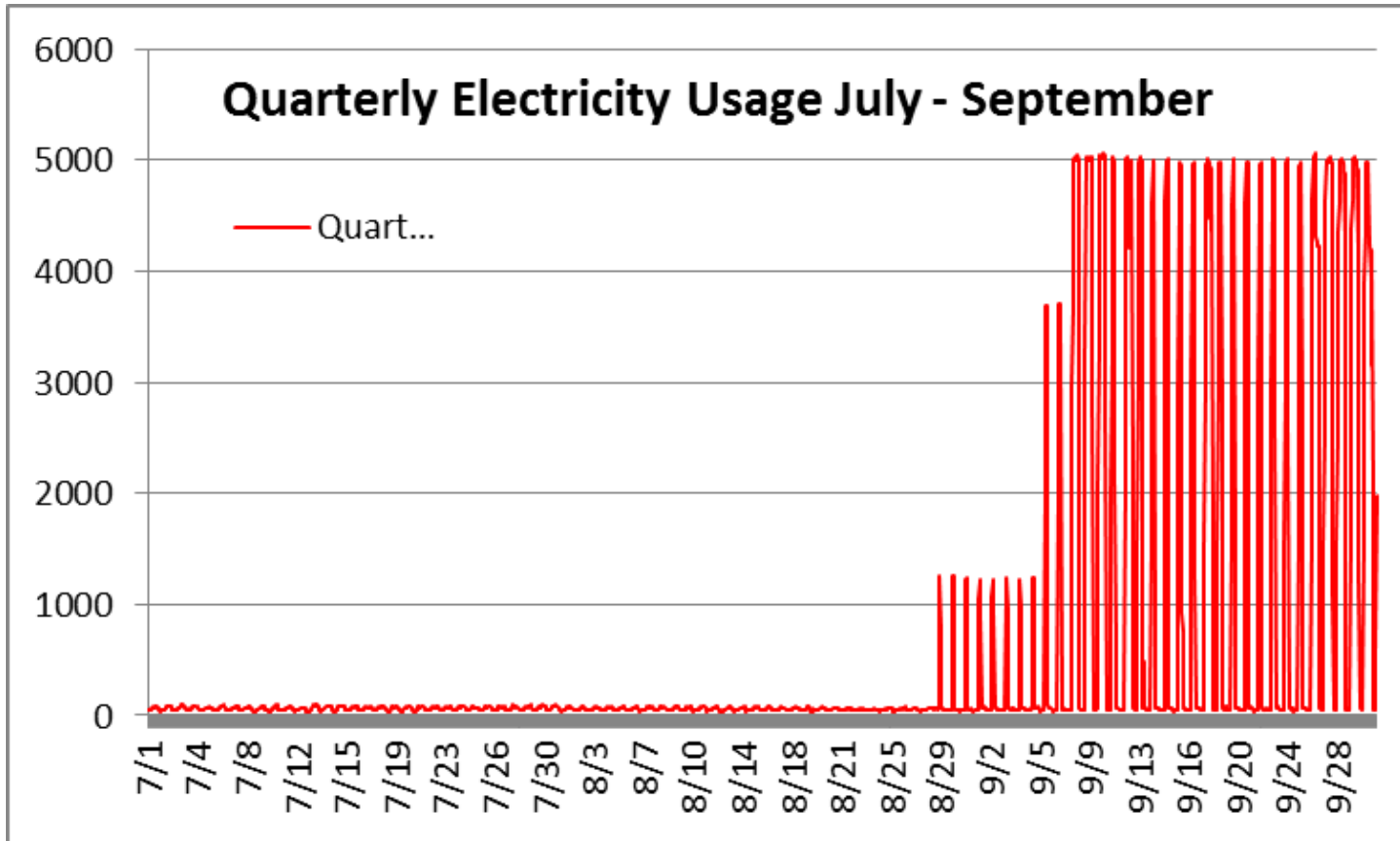


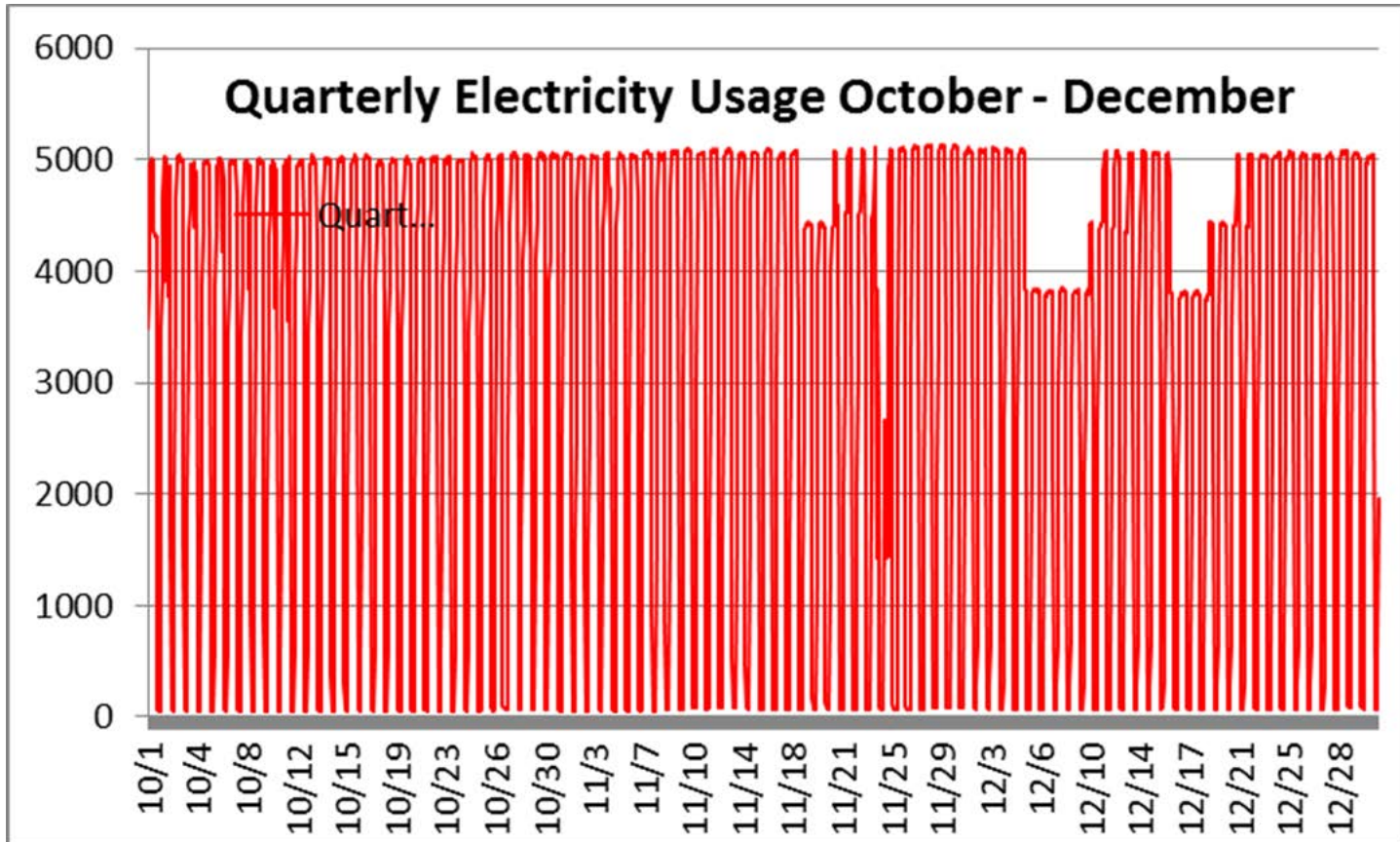


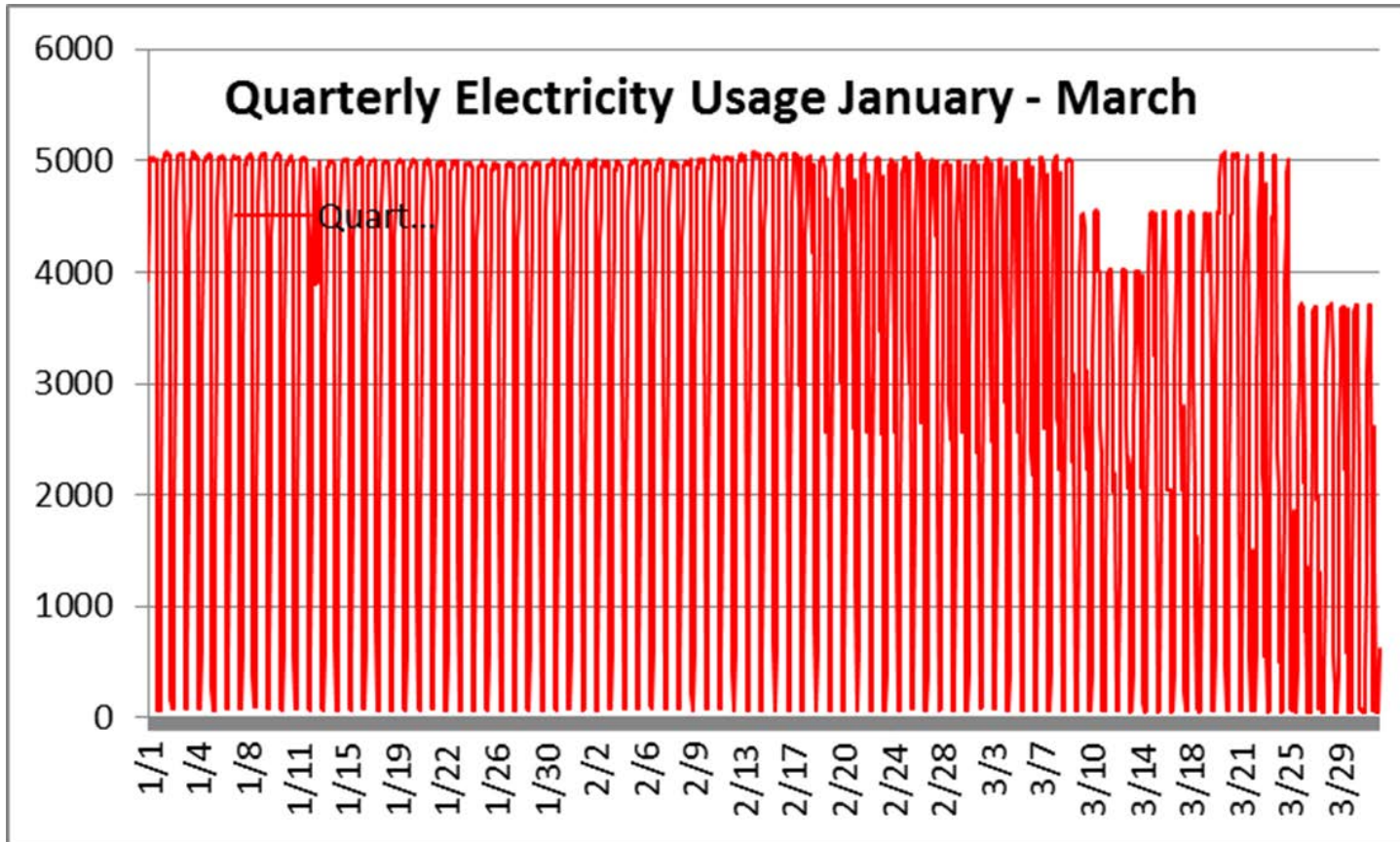


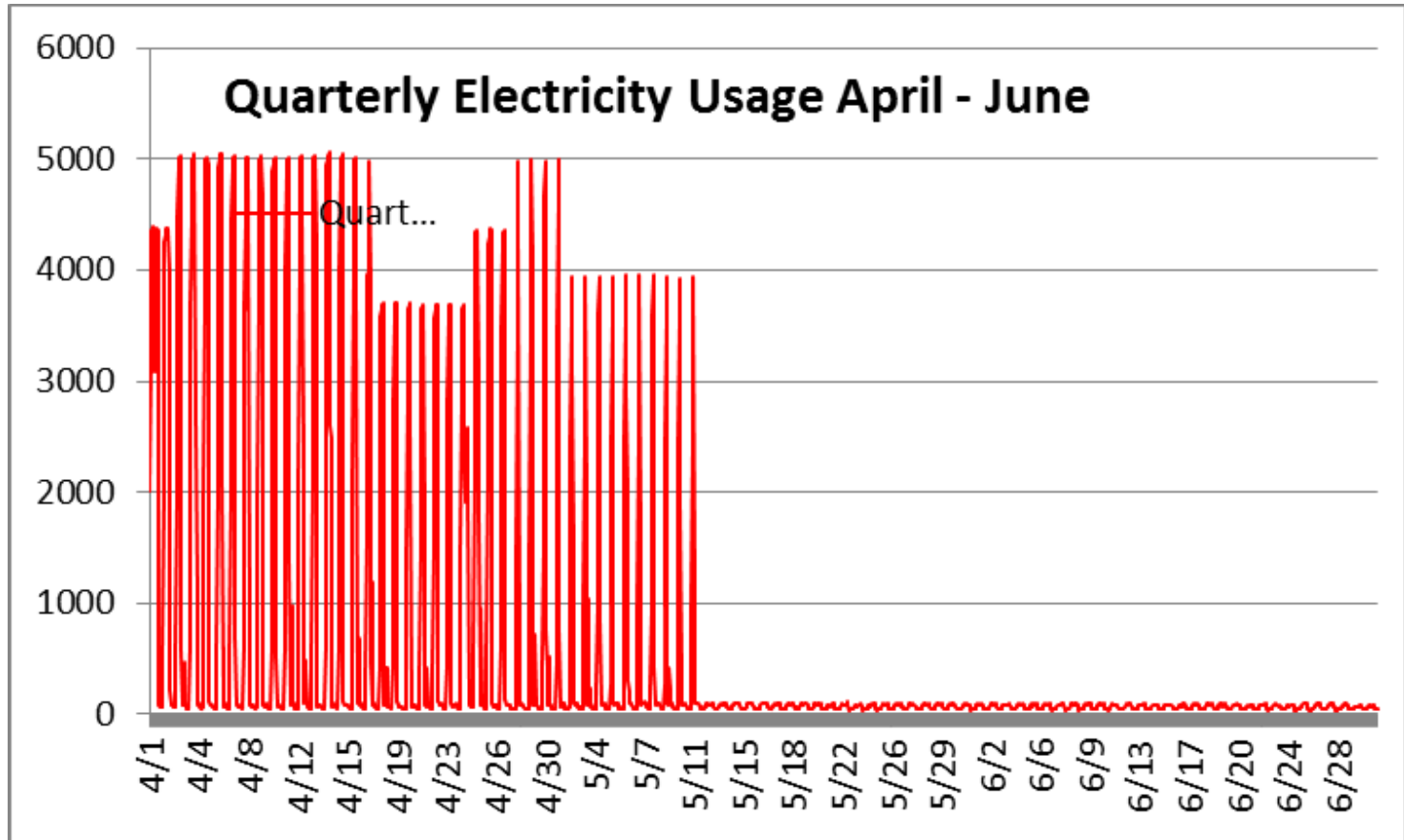


64 Pro325 LumiGrow LED's w/
SmartPAR(spectrum control)
-1st Lighting season upcoming











**THE JOURNEY TO
ENERGY EXCELLENCE**
for Greenhouses

ENERGY ASSESSMENT REPORT

**FOR
MR. ERIC DOEF**

DOEF'S GREENHOUSES LTD.

LACOMBE, AB

BY

360 ENERGY INC.

ANCASTER, ON

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Executive Summary

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- 2.) Greenhouse Energy Statistics
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- 7.) Cogeneration

Appendix A: Electricity Statistics-Spreadsheets

Appendix B: Boiler Test Results-Spreadsheet.

Appendix C: Cogeneration Spreadsheets.

Conversion Factors Used in This Report

- | | |
|--|--------------------------|
| 1 foot = 0.3048 meter | 1 meter = 3.280 foot |
| 1 sq. ft. = 0.0929 sq. M. | 1 sq. M = 10.737 sq. ft. |
| 1 cu. ft. = 0.2832 cu. M. | 1 cu. M = 35.315 cu. ft. |
| 1000 CU Ft. = 28.317 CU M | |
| 1 acre = 43,560 sq. ft = 4046.9 sq. M | |
| 1 boiler horsepower (B.H.P.) = 33,475 BTU/Hr = 9.803 KW | |
| 1 Imp. Gal. = 4.5459 litre, 1000 litre = 1 cu. M | |
| 1 GJ = 948,227 BTU | |
| 1 KWH = 3,413 BTU = 0.00360 GJ, 1 GJ = 277.8 KWH | |
| HHV of natural gas = 1015 BTU/CU Ft. or 0.0378 GJ/CU M | |
| 1 CU M of Natural gas has an HHV of 0.0378 GJ | |
| 1 GJ = 26.455 CU M of Natural Gas at a Higher Heating Value of 1015 BTU/CU Ft. | |

DOEF'S/360 ENERGY INC ENERGY SUPPLY MANAGEMENT

-Made aware of changing energy (natural gas and electrical) market conditions and pricing for natural gas and power.

DOEF'S/360 ENERGY INC

ENERGY SUPPLY MANAGEMENT

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- We have 4 "tier-one" suppliers "papered" allowing us to purchase natural gas and electricity at any time.

DOEF'S/360 ENERGY INC

ENERGY SUPPLY MANAGEMENT

- Made aware of changing energy (natural gas and electrical) market conditions and pricing for natural gas and power**
- We have 4 "tier-one" suppliers "papered" allowing us to purchase natural gas and electricity at any time.**
- Consistently looking at our energy usage (now and forecast) to determine what changes this might have to current procurement strategy.**

DOEF'S/360 ENERGY INC

ENERGY SUPPLY MANAGEMENT

- We breakdown and focus on energy by commodity, Transmission/Transportation and distribution.**
- Energy usage and procurement strategies are reviewed monthly.**

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ENERGY SUPPLY MANAGEMENT

- We breakdown and focus on energy by commodity, Transmission/Transportation and distribution.**
- Energy usage and procurement strategies are reviewed monthly.**
- Request for commodity pricing (RFP) allows us to compare all suppliers pricing options. We want competitive pricing but we do not want to burden the 4 suppliers.**

DOEF'S/360 ENERGY INC

ENERGY SUPPLY MANAGEMENT

- We review demand response options yearly.**
- We always look at what incentive programs are available in the market place to capitalize on reducing our energy usage.**

Doef's Weekly Electrical Report

Average Market Price / kWh, Week 37:

Average Market Price / kWh, Week 38:

Average Doef's Cost / kWh, Week 37:

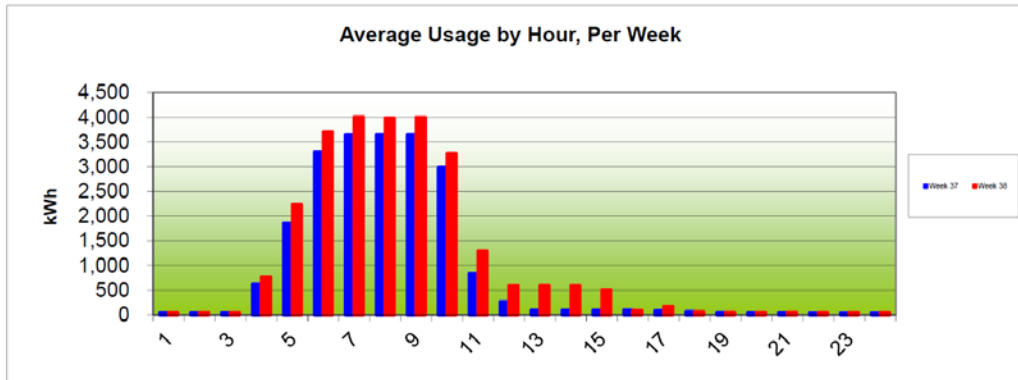
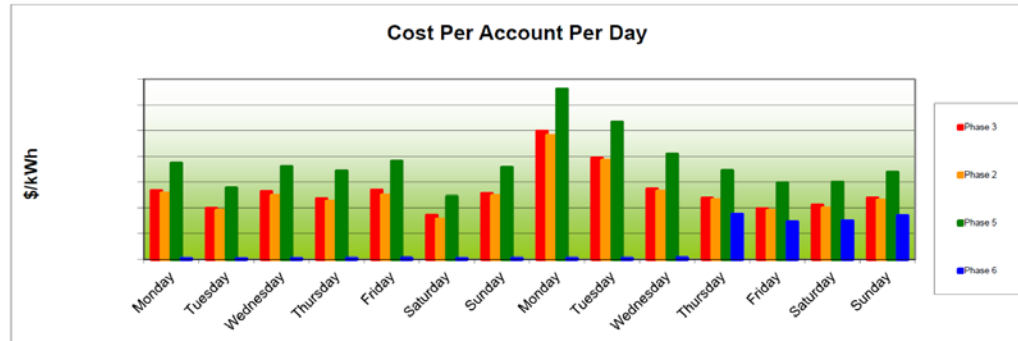
Average Doef's Cost / kWh, Week 38:

Week 37			Avg. Cost per kWh/Day	Week 38			Avg. Cost per kWh/Day
7-Sep	to	13-Sep		14-Sep	to	20-Sep	
	Electricity Usage		Daily Cost		Electricity Usage		Daily Cost
Monday	25,704.70			Monday	39,459.70		
Tuesday	21,552.70			Tuesday	24,511.60		
Wednesday	20,841.10			Wednesday	20,636.40		
Thursday	21,029.40			Thursday	24,677.50		
Friday	20,705.10			Friday	24,630.20		
Saturday	20,663.70			Saturday	24,967.30		
Sunday	21,808.40			Sunday	25,491.70		

TOTALS

Week 37	kwh	\$
TOTAL	152,305.10	

Week 38	kwh	\$
TOTAL	184,374.40	



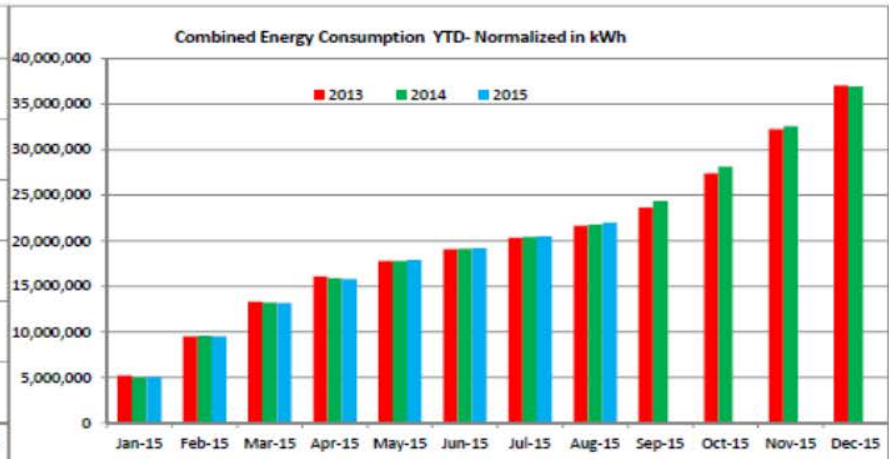
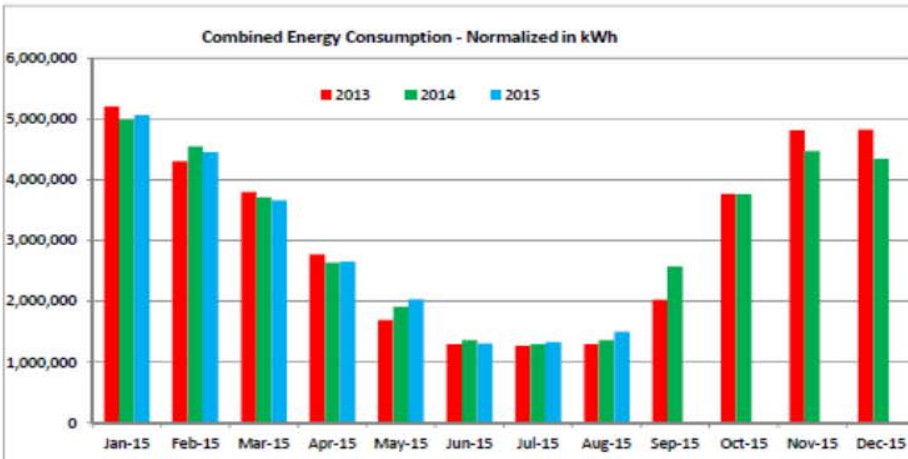
DOEF'S ENERGY Report
 Energy Management Bill SUMMARY
 January 2014 - December 2014



September 29, 2016

Month	Gas					Electricity					Combined		
	Actual Costs	Usage (GJ)	Forecasted Cost	Forecasted Usage	Cost Variance	Actual Costs	Usage (kWh)	Forecasted Cost	Forecasted Usage	Cost Variance	Costs	Forecasted Costs	Variance
January													
February													
March													
April													
May													
June													
July													
August													
September													
October													
November													
December													
YTD													
Total													

Negative variance = over-consuming, Positive variance = under-consuming



The Generator



For the Week Ending: September 18, 2015

	All Hours	ON-PK	Total	Weekday	Weekend
Average (Arithmetic)	7 X 24	5 X 16	OFF-PK	OFF-PK	OFF-PK
Maximum	\$24.80	\$31.12	\$18.70	\$18.30	\$19.69
Minimum	\$84.62	\$84.62	\$73.12	\$30.59	\$73.12
	\$0.00	\$16.42	\$0.38	\$2.70	\$0.38

Year-To-Date: 2014

	All Hours	ON-PK	Total	Weekday	Weekend
Average (Arithmetic)	7 X 24	5 X 16	OFF-PK	OFF-PK	OFF-PK
Maximum	\$8.15	\$13.30	\$1.50	-\$0.67	\$6.94
Minimum	\$172.40	\$172.40	\$19.45	\$12.67	\$19.45
	-\$4.50	-\$4.16	-\$4.50	-\$4.50	-\$4.28

Year-To-Date: 2015

	All Hours	ON-PK	Total	Weekday	Weekend
Average (Arithmetic)	7 X 24	5 X 16	OFF-PK	OFF-PK	OFF-PK
Maximum	\$23.97	\$29.83	\$17.11	\$15.48	\$21.24
Minimum	\$1,402.44	\$1,402.44	\$560.40	\$193.63	\$560.40
	-\$22.42	-\$4.68	-\$22.42	-\$15.52	-\$22.42

Futures Pricing: Sept 22, 2015

	This Week	Last week	Difference
5 x 16	\$34.80	\$37.44	(\$2.64)
Sept	\$31.16	\$31.93	(\$0.77)
Oct	\$43.96	\$44.85	(\$0.89)
Q1 2016	\$32.14	\$33.64	(\$1.50)
2015	\$31.99	\$32.96	(\$0.96)

	7 x 24	Sept	Oct	Q1 2016	2015	2016
Sept	\$29.18	\$31.43	\$26.38	\$33.05	\$26.64	\$26.22
Oct	\$25.83	\$26.38	\$26.38	\$33.05	\$26.64	\$26.22
Q1 2016	\$31.07	\$33.05	\$26.38	\$33.05	\$26.64	\$26.22
2015	\$26.64	\$27.95	\$26.38	\$33.05	\$26.64	\$26.22
2016	\$26.22	\$26.98	\$26.38	\$33.05	\$26.64	\$26.22

2015

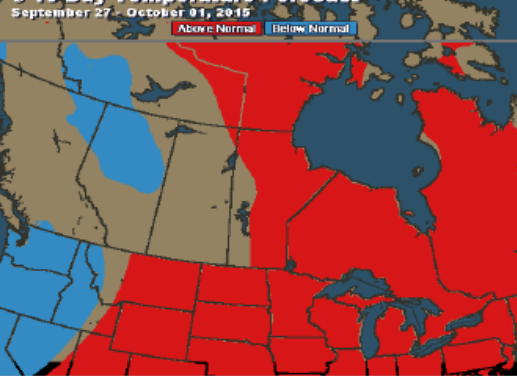
	Arith. Avg. (\$/MWh)	Global Adj. 1st Estimate	Arith. Avg. (HOEP + Global Adjustment)	5x16 Arith. Avg.
January	28.64	55.49	84.13	36.09
February	49.65	69.81	119.46	57.49
March	24.78	36.04	60.82	28.14
April	15.74	67.05	82.79	22.59
May	14.22	94.16	108.38	21.31
June	14.20	92.28	106.48	19.73
July	20.24	88.88	109.12	25.95
August	21.87	88.05	109.92	27.27
September	31.30	82.70	114.00	
Year-to-Date	24.52	74.94	99.46	29.82

Commentary

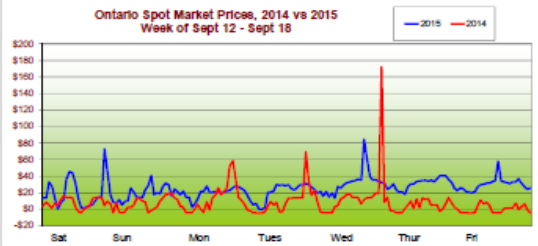
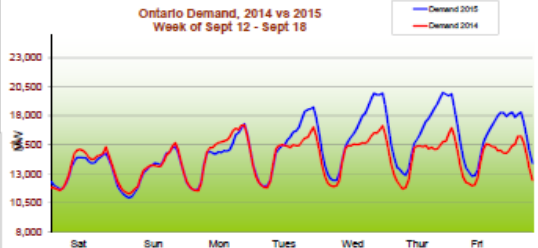
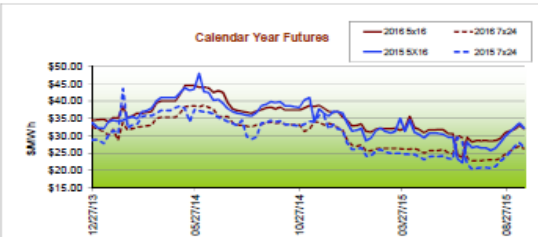
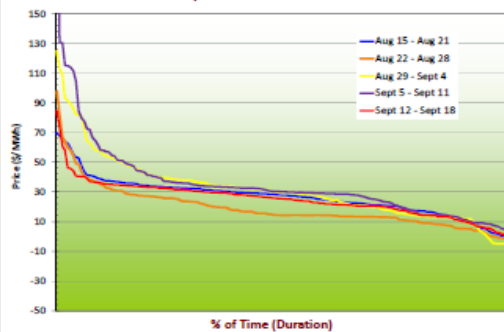
Demand in the province moderated sharply last week as low off-peak temperatures eliminated large amounts of cooling generation, providing relief even during the week's hottest days. Demand averaged 15,143 MW, a drop of 1,903 MW from the week before as a result of the mild conditions which saw the number of heating degree days nearly triple the number of cooling degree days. Demand peaked at just 20,010 MW on Thursday, Sept 17 at 5 p.m. as a result of two days with daily highs above 27 degrees Celsius. Despite the weak demand, prices remained elevated as a result of over 5,000 MW of nuclear generation outages. Demand peaked at \$84.62/MW on Wednesday, Sept 16 at 3 p.m. as a result of the outages. Prices averaged \$24.80/MW on the week, down \$10.16 from the previous week, while the 5x16 average lost \$8.75, coming in at \$31.12/MW.

Average prices for September to date are currently more than double last September's HOEP. The large increase has been driven by both above-average temperatures and nuclear generation outages. The combination of higher demand and lower supply has kept prices supported well above the \$23.97/MW arithmetic average for the year-to-date. Above-average temperatures are forecast for the province for the next 10 days, potentially signaling a return to \$30/MW average pricing to close the month. Demand would need to recover after the mild conditions of the past week, a possibility which could be undercut by seasonal changes to the average temperature. Moderate demand should prevent the worst of the pricing volatility seen so far this year, even as over 9,000 MW of generation remain offline through the end of the month. Nuclear makes up more than half of the generation offline, with more than 5,000 MW out of service due to necessary maintenance. The outages are the second half of a maintenance schedule which included over 4,400 MW of outages in April and May. The outages have been scheduled for shoulder periods to reduce the effect on both baseload and peak-load generation. Even with the large-scale outages, the market has over 28,000 MW of generation still available, resulting in a healthy supply cushion.

6-10 Day Temperature Forecast



Ontario Spot Market Price Duration Curves



Learn More
For more information
Contact a 360 Energy Rep.



James Williams
(905) 304 6001 ext. 222
james.williams@360energy.net

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Your Energy Network

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All prices and information on this page are intended for use as indications only. Prices are indicative of the wholesale market. The material is based on information we consider reliable, but we do not represent that it is accurate or complete and it should not be relied upon as such.

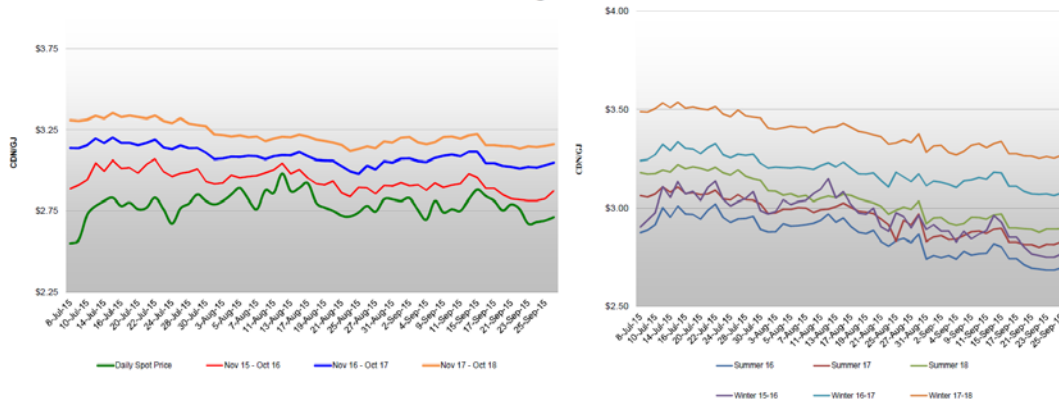
INDICATIVE PRICES

SETTLEMENT PRICES

GAS							GAS				OIL			
Contract Term	AECO (\$/CDN/GJ)						NYMEX (\$US/MMBtu)				NYMEX (\$US/Bbl)			
	Close	Prev.	\$ Change	% Change	Technical	Technical	Close	Prev.	\$ Change	% Change	Close	Prev.	\$ Change	% Change
	28-Sep	25-Sep	vs. Prev	vs Monday	Support	Resistance	28-Sep	25-Sep	vs. Prev	vs Monday	28-Sep	25-Sep	vs. Prev	vs Monday
Day	2.71	2.69	\$0.02	-3%	\$2.60	\$2.90	-	-	-	-	44.43	45.70	(\$1.27)	-5%
Rest of the month	2.71	2.65	\$0.06	0%	\$2.60	\$2.95	-	-	-	-	44.87	46.19	(\$1.32)	-4%
Oct	2.70	2.70	\$0.00	-1%	\$2.50	\$2.95	2.56	2.56	(\$0.00)	0%	45.49	46.84	(\$1.35)	-3%
Nov	2.72	2.67	\$0.05	1%	\$2.25	\$3.00	2.67	2.63	\$0.04	1%	45.49	46.84	(\$1.35)	-5%
Winter 15-16	2.92	2.87	\$0.05	2%	\$2.75	\$3.00	2.87	2.56	\$0.30	11%	47.17	48.58	(\$1.41)	1%
Summer 16	2.84	2.79	\$0.04	2%	\$2.75	\$3.00	2.84	2.83	\$0.00	0%	51.42	52.81	(\$1.39)	4%
Nov15 - Oct16	2.87	2.82	\$0.05	2%	\$2.75	\$3.00	2.85	2.56	\$0.29	11%	54.31	55.68	(\$1.36)	2%
Nov16 - Oct17	3.05	3.03	\$0.02	1%	\$2.75	\$3.50	3.03	2.82	\$0.21	8%	56.35	57.67	(\$1.32)	1%
Nov17 - Oct18	3.16	3.15	\$0.01	0%	\$2.75	\$3.50	3.10	3.03	\$0.07	3%	56.68	57.99	(\$1.31)	-2%
Nov18 - Oct19	3.33	3.31	\$0.01	1%	\$3.00	\$3.50	3.16	3.11	\$0.05	2%	56.68	57.99	(\$1.31)	-3%
Nov19 - Oct20	3.93	3.91	\$0.02	1%	\$3.50	\$4.25	3.25	3.16	\$0.09	3%				
Nov 20- Oct 21	4.18	4.16	\$0.02	1%	\$3.50	\$4.25	3.25	3.25	(\$0.00)	0%				

Note: All prices are based on the previous trading day's settlement and a quantity of 10,000 GJ/day. \$0.10 CDN/GJ has been added to NGX prices to accurately reflect prices for smaller volumes.

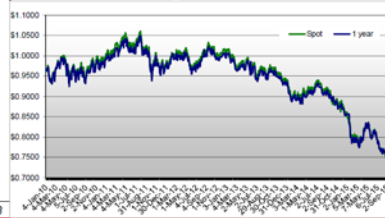
Prices @ AECO



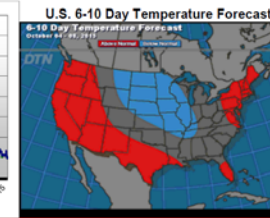
Weighted Monthly Averages - Index 5A

Contract Term	2011-12	2012-13	2013-14	3 Yr Avg	2014-15
November	\$3.0522	\$3.1900	\$3.2462	\$3.1628	\$3.7277
December	\$2.7870	\$3.0061	\$3.6879	\$3.1603	\$3.0202
January	\$2.3443	\$2.8880	\$4.0582	\$3.0968	\$2.6301
February	\$2.0446	\$2.9193	\$7.1862	\$4.0500	\$2.5950
March	\$1.7147	\$3.2881	\$5.0071	\$3.3366	\$2.5893
April	\$1.5759	\$3.4977	\$4.5183	\$3.1973	\$2.4204
May	\$1.9723	\$3.4033	\$4.3429	\$3.2395	\$2.6691
June	\$1.8610	\$3.1413	\$4.4862	\$3.1562	\$2.4578
July	\$2.2336	\$2.6610	\$3.9005	\$2.9317	\$2.7111
August	\$2.0877	\$2.2600	\$3.7567	\$2.7015	\$2.8005
September	\$2.1764	\$1.9946	\$3.7799	\$2.6503	\$2.7526
October	\$2.9365	\$3.1128	\$3.4815	\$3.1769	
Total	\$2.2322	\$2.9469	\$4.2860	\$3.1550	\$2.7613

Exchange Rate \$CDN/\$US



Weather



Summary

Natural gas futures spent most of yesterday's session trading up ahead of expiration but ultimately closed lower as fundamental pressure outweighed the short-covering. Forecasts for mild conditions through both the six- to 10-day and eight- to 14-day periods helped pull prices lower, limiting expectations for demand throughout early October. The spot price at AECO rose by \$0.02 to close at \$2.71 CAD/GJ. The October contract at NYMEX lost \$0.001 to expire at \$2.563 US/MMBtu. The November contract at NYMEX, which took over as prompt month, rose by \$0.039 to settle at \$2.67 US/MMBtu.

Crude oil prices gave back the gains of the previous two sessions, dropping back below \$45 US/bbl as fresh concerns regarding the state of China's economy arose. Official reports showed a year-over year decline in industrial profits, indicating a potential weakness in demand from the world's second-largest economy. The November contract at NYMEX lost \$1.27 to settle at \$44.43 US/bbl.

Outlook

Estimates for the upcoming storage report cover a 24-Bcf range, from a low of 88 Bcf to a high of 112 Bcf. The early consensus estimate for this week's storage report is calling for a 102-Bcf injection, which would pull inventories to 3,542 Bcf for the week to Sept. 25. A build at estimates would guarantee a surplus against the EIA's Short-Term Energy Outlook's estimates for September. A strong surplus position in September should set the stage for another surplus in October. With weather expected to remain moderate throughout much of October, builds should continue to average in the triple digits, filling inventory to beyond the 3,900-Bcf mark by the end of the month. Early forecasts for a mild start to the winter could add pressure to prices, as healthy inventories could remain full longer than normal, expanding the surpluses through the early withdrawal season.

Growth concerns have not been restricted to China, with the International Monetary Fund announcing that global growth was almost certain to underperform to their previous estimates. Prices could find modest support in news that Royal Dutch Shell will be halting Arctic explorations for crude oil, closing off one new avenue of additional production.





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