



*International Food and Agribusiness Management Review*  
*Volume 8, Issue 3, 2005*

## ***Veggies 4U's Energy Pricing Dilemma\****

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### **Abstract**

*Veggies 4U* is a young and dynamic family-run greenhouse: Lucy and her husband run the business with the help of a small group of friends and colleagues who serve on the company's Board of Directors. Lucy is preparing a report to the Board to recommend a natural gas supply contract for the next three years. The company has received four different contract offers, ranging from a simple forward contract, to a maximum cost contract with a price floor. The case focuses on the pricing and risk management opportunities offered by an integrated North American natural gas market. Lucy has to assess the different supply contract offers received by the company and to reverse engineer them in order to benchmark their cost with that of potential synthetic alternatives *Veggies 4U* could build. Once Lucy has decided what to recommend, she has to sell it to the Board.

**Keywords:** energy price risk; natural gas supply contract; financial engineering; risk management policy.

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\* Consistent with the IFAMR Editorial Policy, the editorial review process for this manuscript was coordinated by Gregory Baker, past Editor of the IFAMR.

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### **IAMA Agribusiness Case 8.3.A**



Lucy Ball and her husband Jack own *Veggies 4U* a large, modern greenhouse operation in Leamington, Ontario. Leamington is considered the capital of Ontario's greenhouse industry, supplying major markets in both Canada and the US. The concentration of greenhouses around Leamington is impressive, and this is why the Balls decided to locate their business there. As is the case for many greenhouse operators in Leamington, Lucy looks after the administration and Jack after the production. Their business is incorporated, with a simple corporate structure: Lucy is President and CEO; Jack is COO. Lucy's father-in-law is Chairman of the small Board of Directors: Lucy, her husband Jack, their accountant Bill, and two old friends, Karl and John, both proactive local cash crop farmers.

During the last few weeks Lucy had been busy, among many other responsibilities, studying the energy markets. Energy, mainly natural gas (NG), is an important cost item for the company, accounting for 25% of total expenses in the fiscal year just ended. Fortunately enough, thanks to Lucy's determination, three years ago (April 2002) *Veggies 4U* had decided to lock in their natural gas cost with a 3-year forward price contract. This decision was not easy, as the traditional greenhouse company did not have any in-house energy management skills, but Lucy's determination paid off well as the contracted price, C\$0.21/m<sup>3</sup>, ended up being significantly lower than prevailing market prices. Indeed this significant saving provided additional operating capital to the expanding business. However, the forward contract was coming to an end, and Jack had asked Lucy to look into it and report to the Board with a recommendation on what to do, on how to manage this cost in the next 3 years.

Lucy has completed her homework, and today, February 12, 2005, she is almost ready to report to the Board. Lucy is convinced that it is in the best interest of her business to lock in the price, and has drafted a supporting document to be discussed at the Board meeting (an excerpt of this document is presented as Attachment A).

Her submission is organized in 4 already completed parts:

- A simple market backgrounder with a concise visual introduction to the North American Natural Gas Market, its main pricing points and trading hubs (please refer to: "*Natural Gas: A Highly Integrated North American Market*" later in this document).
- A synopsis of the most recent market conditions with a comparison of conditions one year earlier (please refer to "*Market Conditions on February 11<sup>th</sup>, 2005*").
- The description of the offers received by *Veggies 4U*; for simplicity only comparable firm offers are considered (please refer to "*Firm Offers Received by Veggies 4U*").
- The description of the results of Lucy's due diligence in exploring the possibility to manage the NG purchases "in house", by combining different

exchange-traded contracts with direct purchases at the well head and contracts with pipelines for transportation to Ontario (please refer to “*Due Diligence: Exploring “Synthetic” Pricing Opportunities*”).

Before completing the “Conclusions and Recommendations” closing chapter of her document, Lucy is reflecting on the challenges and opportunities offered by the “in-house” alternative. She realizes that any “synthetic” strategy will require reasonably sophisticated professional skills, careful governance policies, proper delegation of specific trading activities, and careful monitoring of their implementation... and lots of discipline.<sup>1</sup> She feels she is motivated and ready to meet this professional challenge, given its cost saving opportunities. After all, as trustee for the local school board, Lucy has appreciated the significant savings realized by several players in Ontario’s public sector who use this approach to price their natural gas requirements.

Lucy’s most immediate task is to write the final section of the document, the “Conclusions and Recommendations”. She is keenly aware of the fact that she does not have all the necessary information, but feels comfortable she has enough to properly rank the available alternatives according to their cost to *Veggies 4U*. She knows that doing nothing would, by default, mean to expose the company to highly volatile cash prices. It is time for a decision: the offers by the different natural gas marketers are only good for a limited period of time, and there is a strong probability that a resubmission would be at much higher prices.

To complete her Board submission, Lucy plans to address these four points:

1. She will rank the contracts in terms of their relative pricing attractiveness to *Veggies 4U* (the contracts are otherwise comparable);
2. She will address the market assumptions implicit in this ranking, and explore under what conditions the ranking may change;
3. She will assess the additional pricing flexibility offered by basis contracts, for example using Dawn, ON, as underlying market, and describe how *Veggies 4U* could reasonably take advantage of them;<sup>2</sup>
4. Finally she will discuss the potential benefit of combining derivative and cash contracts to replicate the risk exposure offered by marketers, and will compare strength and weaknesses of this approach with the more convenient solutions offered by the marketers.

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<sup>1</sup> In this context, “synthetic” means the combination of different derivative instruments to create the desired risk exposure for *Veggies 4U*. This exposure may be similar to the one that could be achieved by signing a contract with one of the marketers.

<sup>2</sup> Dawn is the main hub for NG in Ontario.

## Attachment A: Excerpt from Lucy's Report to Veggies 4U's Board

### *Excerpts from Chapter 1 of the Report – Natural Gas: A Highly Integrated North American Market*

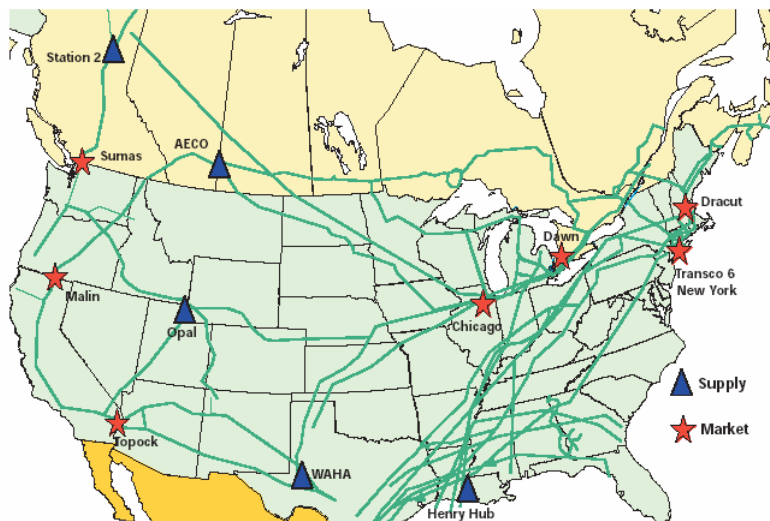
The North American natural gas market is highly integrated, as shown by the following three exhibits:

- Figure 1 illustrates the main trading hubs and pricing points in North America.
- Figure 2 links the trading hubs and pricing points with production basins and major commodity flows.
- Figure 3 illustrates Ontario's main pipelines, trading hubs and export points.

Different pricing units are used at different pricing points in North America. For example:

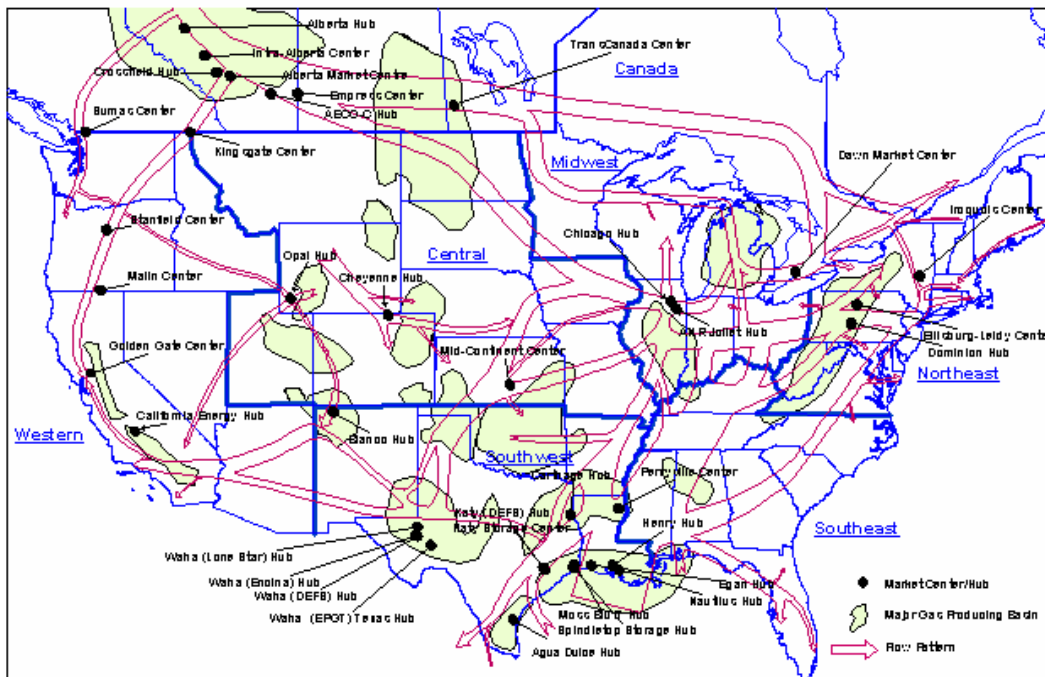
- The futures and options prices on the New York Mercantile Exchange (NYMEX) are in US dollars per million British thermal units (US\$/MMBtu);
- Ontario spot and forward prices are in Canadian dollars per cubic meter (C\$/m<sup>3</sup>);
- Alberta prices are in Canadian dollars per Gigajoule (C\$/Gj) or in Canadian dollars per million cubic feet (C\$/MMcf).

The different measures are easily compared, as illustrated in Table 1.



**Figure 1:** North American Trading Hubs and Pricing Points

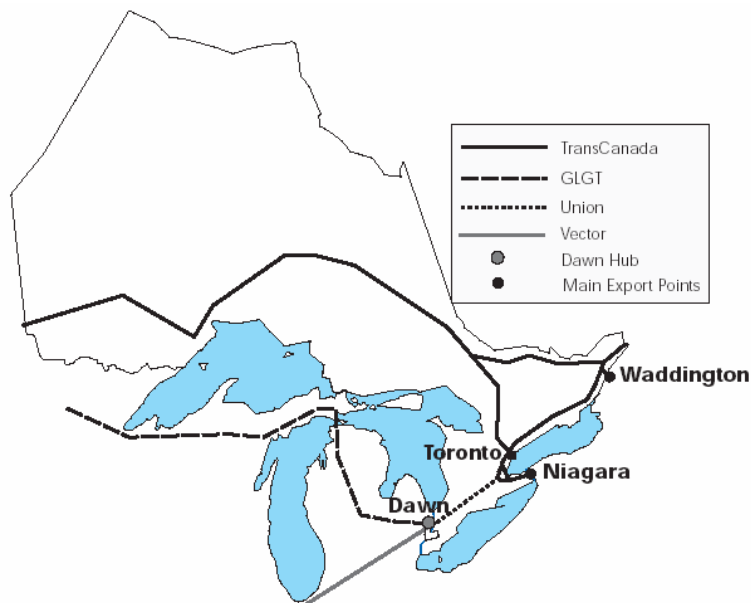
Source: Adapted from “Canadian Natural Gas Market Dynamics and Pricing”, Oct 02, National Energy Board, [www.neb-one.gc.ca](http://www.neb-one.gc.ca).



Note: DEFS = Duke Energy Field Services Co.; EPGT = EPGT Texas Pipeline Co.  
 Source: Energy Information Administration, GasTran Gas Transportation Information System, Natural Gas Market Hubs Database, as of August 2003.

**Figure 2: Natural Gas Centers/Hubs, Production Basins and Major Flow Corridors**

Source: [http://www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/feature\\_articles/2003/market\\_hubs/mkthubs03.pdf](http://www.eia.doe.gov/pub/oil_gas/natural_gas/feature_articles/2003/market_hubs/mkthubs03.pdf).



**Figure 3: Ontario Natural Gas Pipelines, Pricing Hubs and Export Points.**

Source: “Canadian Natural Gas Market Dynamics and Pricing”, Oct 02, National Energy Board, [www.neb-one.gc.ca](http://www.neb-one.gc.ca).

**Table 1: Converting Different Prices to a C\$/m3 and C\$/MMBtu**

Market <sup>1</sup>	Prices at different North American Pricing Points (in original units)			Exch. Rate, US dollar per Canadian dollar (US\$/C\$)	Divisor to price per cubic meter <sup>2</sup>	Price and implied NYMEX basis, C\$/m3		Price and implied NYMEX basis, C\$/MMBtu	
	US\$ per million British thermal unit, (US\$/MMBtu)	C\$ per thousand cubic feet, (C\$/Mcf)	C\$ per cubic meter, (C\$/m3)			Price	NYMEX Basis	Price	NYMEX Basis
NYMEX Futures	5.40			0.765	27.99	0.2522		7.0588	
AECO Spot		5.94			28.32	0.2097	(0.0425)	5.8708	(1.1880)
Dawn Spot		7.25			28.32	0.2560	0.0038	7.1655	0.1067
Regulated Utility in Ontario			0.406		1.00	0.4060	0.1538	11.3639	4.3051

<sup>1</sup> AECO is the reference cash market in Alberta; Dawn is the reference cash market in Ontario.

<sup>2</sup> These technical coefficients are used: 1 MMBtu = 1.06 GJ = 988.56 cf = 27.99 m<sup>3</sup>

Source: adapted from [www.energyshop.com/energyshop/tools](http://www.energyshop.com/energyshop/tools).

*Excerpts from Chapter 2 of the Report – Market Conditions on February 11th, 2005*

The prevailing market conditions on February 11<sup>th</sup>, 2005 are presented in Table 2, together with prior-year data.

**Table 2: Market Conditions on Friday February 11<sup>th</sup>, 2005 and 2004**

Natural Gas	Pricing Unit <sup>1</sup>	Feb 11 2005 Close	Feb 11 2004 Close	YTD Average
AECO Spot <sup>2</sup>	(\$/Mcf)	6.52	6.25	6.60
Differential (Henry Hub/AECO)	(\$/Mcf)	0.95	1.16	1.02
AECO Winter Nov05-Mar06	(\$/Mcf)	6.79	6.57	
AECO Winter Nov05-Mar06	(\$/Mcf)	7.68	6.22	
AECO 1-Year Nov05-Oct06	(\$/Mcf)	7.04	6.00	
Dawn, Ontario	(\$US/MMBtu)	7.86	7.64	
Henry Hub Spot	(\$US/MMBtu)	6.03	5.64	6.19
NYMEX Mar05 <sup>3</sup>	(\$US/MMBtu)	6.09	5.54	
NYMEX 12 Month Strip	(\$US/MMBtu)	6.56	5.49	
NYMEX 2006 Strip	(\$US/MMBtu)	6.48	5.18	

<sup>1</sup> Mcf = thousand cubic feet ; MMBtu = million British thermal units.

<sup>2</sup> Refer to Figure 1 for the geographic location of the different markets.

<sup>3</sup> Henry Hub is a par delivery point for NYMEX futures.

*Excerpts from Chapter 3 of the Report – Firm Offers Received by Veggies 4U*

Table 3 presents the terms of the supply offers received by *Veggies 4U* and expiring on Friday, February 25<sup>th</sup>. Terms of the four Offers are otherwise comparable.

**Table 3:** Natural Gas supply offers received by *Veggies 4U*

Contract #	Supplier	Terms
1	Company a	Natural gas delivered to Dawn, the Utility’s pipeline at the Ontario border, priced at the average AECO cash price plus C\$0.07/m3.
2	Company b	Natural gas delivered to Dawn, the Utility’s pipeline at the Ontario border, priced at the average AECO cash price plus C\$0.09/m3, with a cap of C\$0.35/m3.
3	Company c	Natural gas delivered to Dawn, the Utility’s pipeline at the Ontario border, priced at the average AECO cash price plus C\$0.08/m3, with a cap of C\$0.34/m3 and a floor of C\$0.26/m3.
4	Local Utility	Natural gas delivered to the customer location at a fixed price of C\$0.40/m3.

Contracts 1 to 3 do not include a C\$0.05/m3 fee payable to the provincial regulated natural gas utility covering the cost of transferring the commodity from the Ontario border to *Veggies 4U*’s location. All three marketers agreed to lock this fee for the three years of the contract. As noted previously, AECO is the cash reference market in Alberta. An assessment of the credit risk presented by the four marketers points to similar results. All marketers have independent professional Boards, are well funded, bank with reputable financial institutions, and report in a timely manner on their portfolios of physicals as well as derivatives. For credit risk purposes the four marketers could be considered equivalent to the regulated utility. All offers meet a standardized contract protocol defined by Lucy on behalf of *Veggies 4U*.

*Excerpts from Chapter 4 of the Report – Due Diligence: Exploring “Synthetic” Pricing Opportunities*

Due diligence requires *Veggies 4U* to consider the opportunity offered by the existing contracts traded on organized exchanges or over-the-counter. Quite simply, *Veggies 4U* could combine a spot purchase at the well head in Alberta, with appropriate hedges on the NYMEX or the Calgary – based Natural Gas Exchange (NGX), or could simply choose to purchase a contract deliverable at Dawn, the main hub in Ontario. *Veggies 4U* is attracted by the opportunities offered by the NGX, whereas the company feels its volume would not be sufficient to trade over-the-counter (other than with the markets who submitted firm offers). The NGX “*is a*

leading North American energy exchange based in Calgary. Since 1994, NGX's unique market model has provided traders with one of the most highly liquid, secure and efficient environments available for trading and clearing natural gas and electricity contracts. NGX is wholly owned by TSX Group [Toronto Stock Exchange], which collectively manages all aspects of Canada's senior and junior equity markets.” (source: <http://www.ngx.com/> ).

Veggies 4U is considering the contract specifications of the ATCO-North and the Union Dawn contracts traded on the TSX, illustrated in Table 4 and Table 5.

**Table 4:** Contract Specifications, ATCO – North

ATCO North is located on ATCO Pipelines' North Integrated System. This market, which trades in \$CDN/GJ, is connected to numerous intra-Alberta markets and pipelines such as TransCanada, Alliance and TransGas.

**Contract Specifications**

Hub ID	AN
Delivery	ATCO North title transfer service in gigajoule (GJ)
Price Quotation	Canadian dollars and cents per GJ
Size Quotation	Terajoules (TJ)
Min. Price Tick	\$0.0001 C\$/GJ
Min. Contract Size	1 TJ per day

Source: <http://www.ngx.com/>.

**Table 5:** Contract Specifications, NGX – Union Dawn including Dawn Daily Index

Located and physically deliverable at the Union Gas Dawn Storage hub, this market contains spot and forward instruments that trade in price units of \$US/MMBtu. All transactions are physically cleared in GJ's utilizing the Union Gas Name Change Service at Dawn.

**Contract Specifications**

Hub ID	UD
Delivery	Union Gas Dawn Name Change Service in gigajoules (GJ), translated from Millions of British Thermal Units (MMBtu) at 1.055056 GJ/MMBtu
Price Quotation	US dollars and cents per MMBtu
Size Quotation	BBtu (Billions of British Thermal Units)
Min. Price Tick	\$0.0001 US/MMBtu
Min. Contract Size	1.0 BBtu (1000 MMBtu) per day

Source: <http://www.ngx.com/>.



Table 6 details the additional contract specifications of NGX contracts: from very short 24-hour contracts, to multiple-day contracts, to monthly contracts, to longer multi-month seasonal contracts.

**Table 6:** Additional Specifications, NGX Contracts – Effective Dates, Period End Dates and Calculation Periods for Physical Instrument.

Natural Gas - Physical Instruments			
Instruments	Effective Date	Period End Date	Calculation Period
YD	09:00 Day Prior to Today	09:00 Today	24 Consecutive Hours
SD	09:00 Today	09:00 Tomorrow	24 Consecutive Hours
D1	09:00 Tomorrow	09:00 Two days from today	24 Consecutive Hours
D2	09:00 Two days from today	09:00 Three days from today	24 Consecutive Hours
D3	09:00 Three days from today	09:00 Four days from today	24 Consecutive Hours
D4	09:00 Four days from today	09:00 Five days from today	24 Consecutive Hours
D5	09:00 Five days from today	09:00 Six days from today	24 Consecutive Hours
M2, 3, 4, 5, 6, 7	Monday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
T2, 3, 4, 5, 6, 7	Tuesday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
W2, 3, 4, 5, 6, 7	Wednesday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
R2, 3, 4, 5, 6, 7	Thursday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
F2, 3, 4, 5, 6, 7	Friday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
SA2, 3, 4, 5, 6, 7	Saturday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
SU2, 3, 4, 5, 6, 7	Sunday 09:00	09:00 2, 3, 4, 5, 6, 7 days later	2 to 7 consecutive days
RM-Todays date	09:00 Today	09:00 First day of Near Month	2 to 30 days
RM-Day 1	09:00 Tomorrow	09:00 First day of Near Month	2 to 29 days
RM-Day 2	09:00 2 Days from Today	09:00 First day of Near Month	2 to 28 days
RM-Day 3	09:00 3 Days from Today	09:00 First day of Near Month	2 to 27 days
RM-Day 4	09:00 4 Days from Today	09:00 First day of Near Month	2 to 26 days
RM-Day 5	09:00 2 Days from Today	09:00 First day of Near Month	2 to 25 days
RM-Day 6	09:00 2 Days from Today	09:00 First day of Near Month	2 to 24 days
M1	09:00 First Day of Near Month	09:00 First Day of Second Nearby Month	28 - 31 days
M2	09:00 First Day of Second Nearby Month	09:00 First Day of Third Nearby Month	28 - 31 days
M3	09:00 First Day of Third Nearby Month	09:00 First Day of Fourth Nearby Month	28 - 31 days
M4	09:00 First Day of Fourth Nearby Month	09:00 First Day of Fifth Nearby Month	28 - 31 days
M5	09:00 First Day of Fifth Nearby Month	09:00 First Day of Sixth Nearby Month	28 - 31 days
M6	09:00 First Day of Sixth Nearby Month	09:00 First Day of Seventh Nearby Month	28 - 31 days
M7	09:00 First Day of Seventh Nearby Month	09:00 First Day of Eighth Nearby Month	28 - 31 days
M8	09:00 First Day of Eighth Nearby Month	09:00 First Day of Ninth Nearby Month	28 - 31 days
M9	09:00 First Day of Ninth Nearby Month	09:00 First Day of Tenth Nearby Month	28 - 31 days
M10	09:00 First Day of Tenth Nearby Month	09:00 First Day of Eleventh Nearby Month	28 - 31 days
M11	09:00 First Day of Eleventh Nearby Month	09:00 First Day of Twelfth Nearby Month	28 - 31 days
M12	09:00 First Day of Twelfth Nearby Month	09:00 First Day of Thirteenth Nearby Month	28 - 31 days
M13	09:00 First Day of Thirteenth Nearby Month	09:00 First Day of Fourteenth Nearby Month	28 - 31 days
Q1	09:00 First Day of January	09:00 First day of Following April	90 or 91 days
Q2	09:00 First Day of April	09:00 First day of Following July	91 days
Q3	09:00 First Day of July	09:00 First day of Following October	92 days
Q4	09:00 First Day of October	09:00 First day of Following January	92 days
GY	09:00 First day of Nearby November	09:00 First day of Second Nearby November	365 or 366
SB	09:00 First day of Nearby April	09:00 First day of Following November	214
WB	09:00 First day of Nearby November	09:00 First day of Following April	151 or 152 days
CY	09:00 First day of Nearby January	09:00 First day of Following January	365 or 366 days
RGY	09:00 First day of First Nearby Month	09:00 First day of Following November	31 to 335 days
RSB	09:00 First day of Nearby Month	09:00 First day of Following November	31 to 183 days
RWB	09:00 First day of Nearby Month	09:00 First day of Following April	31 to 121 or 122 days
RCY	09:00 First day of First Nearby Month	09:00 First day of Following January	31 to 334 or 335 days

Source: <http://www.ngx.com/>.

The evidence presented in the last three tables is consistent with *Veggies 4U* building advanced synthetic strategies using contracts traded at the NGX. In addition, *Veggies 4U* could use NYMEX futures options to further shape -if and when needed- the risk profile of NGX traded contracts.

Three strategies appear of some interest:

- a. Combining a direct well head spot purchase with a NYMEX-based hedge and a basis contract for AECO NG price, plus a transportation contract from Alberta to Ontario. Delivery from Alberta to Ontario can be arranged for C\$0.06/m<sup>3</sup>. This portfolio would include a long NG futures hedge on NYMEX, a short C\$ futures hedge on the International Monetary Market of the Chicago Mercantile Exchange (IMM), a long AECO basis contract, and a long transportation contract from AECO to Dawn. The standard Ontario distribution fee would then added by the regulated utility.
- b. The previous strategy could be modified by replacing the NYMEX-based hedge and basis contract by a long position in the ATCO-North contract traded on the NGX. This would avoid the need for a C\$ hedge, as the NGX instrument is priced in C\$. The portfolio would then consist of a long NGX ATCO-North contract and a long transportation contract from AECO to Dawn. Also in this case the Ontario distribution fee charged by the regulated utility would apply.
- c. Finally, *Veggies 4U* could combine a natural gas purchase in the Alberta spot market with a transportation contract to Dawn, a hedge using a NGX contract deliverable at Dawn, and the appropriate C\$ hedge. The portfolio would include spot purchases in Alberta, transportation contracts to Dawn, Ontario, a long hedge using the NGX contract deliverable at Dawn, priced in US\$, and a short C\$ hedge at the IMM. The Ontario distribution fee charged by the regulated utility would be due also in this case.

These strategies are relatively straightforward, but serious consideration should be given to the implicit cost of the convenience offered by marketers vs. the objective cost of the resources needed to “do a good job” with an actively managed pricing strategy.

*Excerpts from Chapter 5 of the Report – Conclusions and Recommendations*

..... (this is where Lucy is, and where your skills will help her.)