Carbon prices

Embedded in ”Commodity risk management”

CO2 Conference, 25 March 2019

Tom Schurmans & Richard Cornielje

Cargill KYOS

Do not try to beat the market…

Be prepared

Cargill KYOS

KYOS software overview

Consumer based risk management software

- KYOS PRM
  - S&OP Support - BI with regards to contracts vs budgets
  - Analytics - Sophisticated market price analytics
  - MT Reporting - Positions, cash flow vs budgets
    - Short term & long term risks
  - "BI" - Decision support




Producer based modelling software

- KyPlant - Power plant optimization and valuation
- KyCurve - Create price forward curves
- KyStore - Storage valuation & portfolio optimization


Cargill KYOS

KYOS Business Intelligence adds value to the chain

Budgets, contracts, inventory & market price analytics

SAP looks back, used for invoicing & control

KYOS looks forward

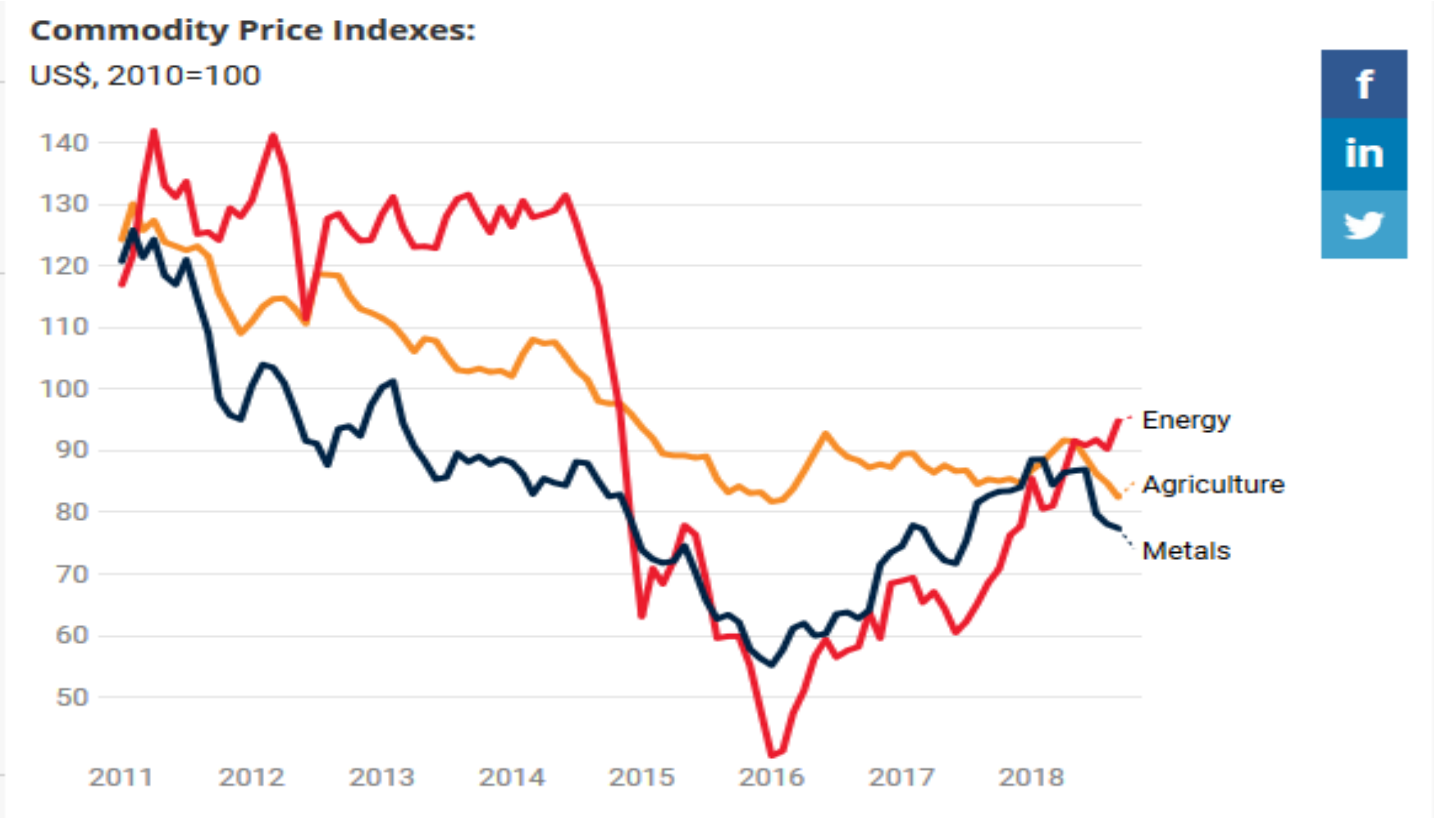
- Hedge strategies
- Cash flows
- Positions
- Risks

Decision support

Business Intelligence

Cargill KYOS

Worldbank



Commodity prices have been buffeted by a number of factors this year, including commodity-specific disruptions, rising U.S. interest rates, an appreciation of the U.S. dollar, growing trade tensions between major economies, and financial market pressures in some emerging market and developing economies.

LME shifted towards Shanghai

CME Group & Euronext

CME but now also EEX

Common factor: “price reference – indexation ”

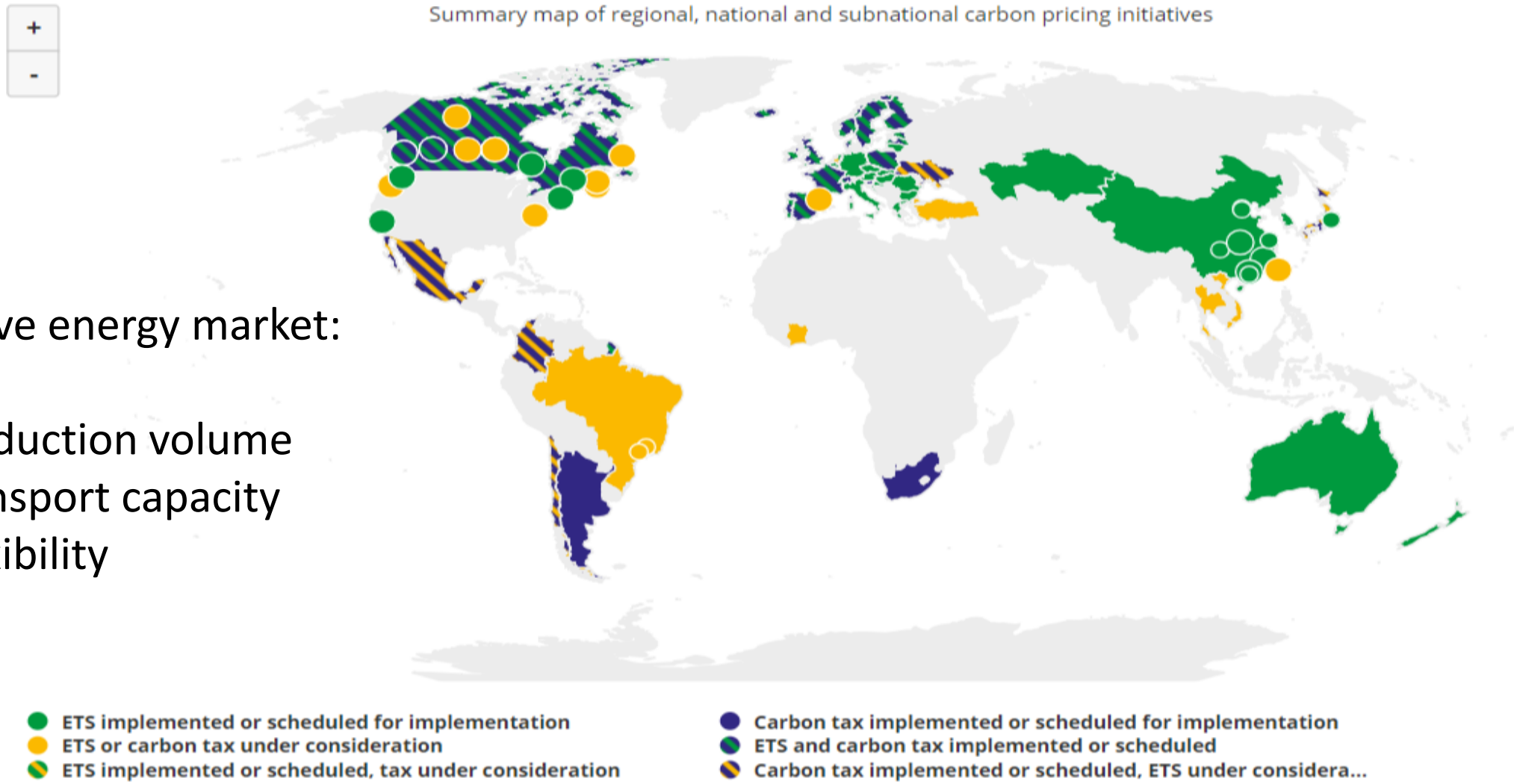
- **Chemical-, Steel- & Energy producers:**
  - Gas, Coal, Oil, Iron Ore, Power and Carbon (Emissions)

- **Beverage-, Food- and Fertilizer industry:**
  - Sugar, Grains, PalmOil, Corn, Soybeans, **Energy (incl. Carbon)**

- **Packaging- & Waste industry:**
  - Glass, Plastics, Aluminium/Steel, **Energy (incl. Carbon)**

Cargill KYOS

Global Emissions Trading



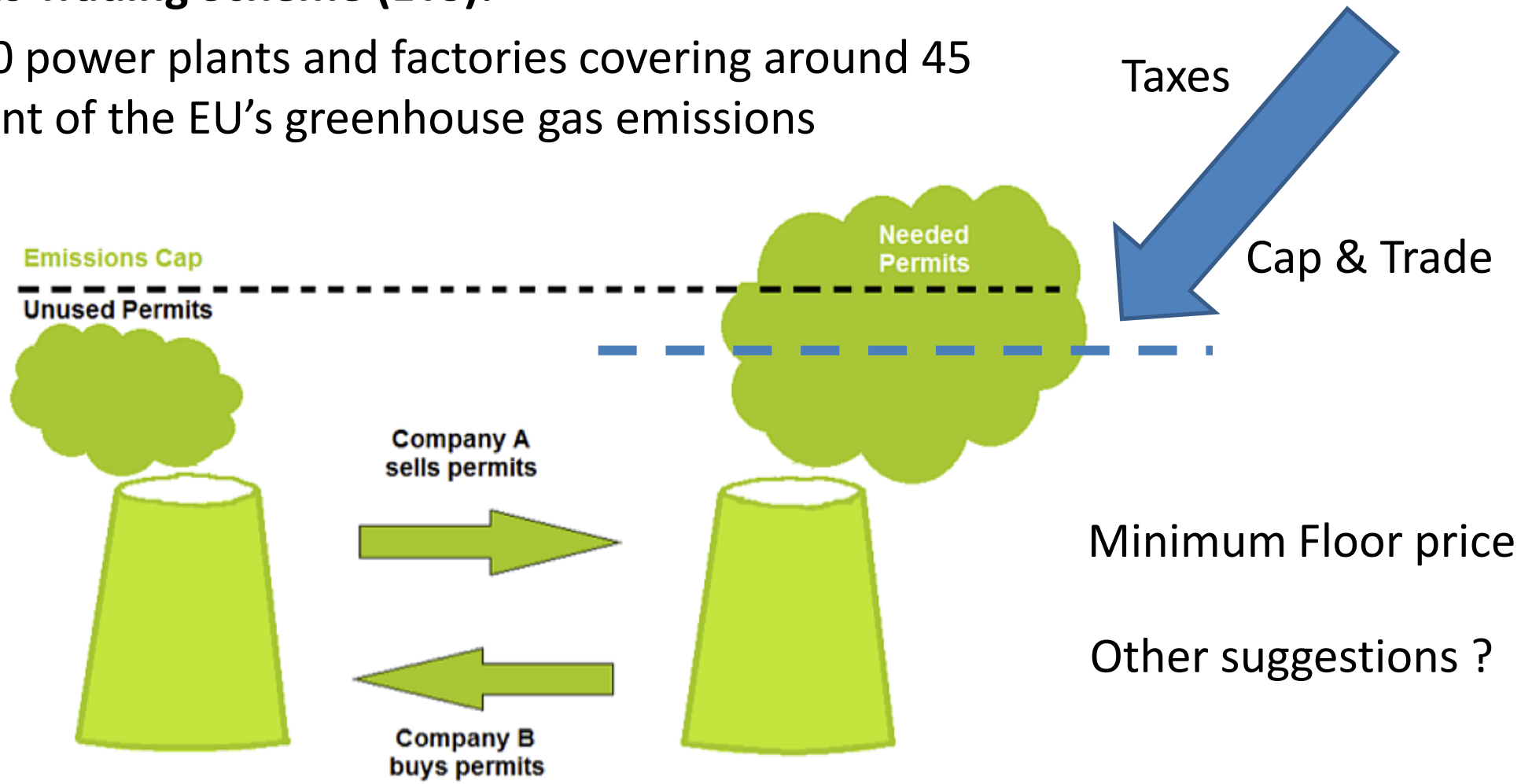
Effective energy market:

- Production volume
- Transport capacity
- Flexibility

EU ETS = European Union Emissions Trading Scheme

EU Emissions Trading Scheme (ETS):

- 11,000 power plants and factories covering around 45 per cent of the EU's greenhouse gas emissions



Minimum Floor price

Other suggestions ?

Emissions Trading Scheme = Phase I 2005-2007 II 2008-2012

- The EU ETS includes power stations, energy-intensive industries (e.g. oil refineries, steelworks, producers of iron, aluminium, cement, paper, and glass)

- Phase I and Phase II Most of the allowances were given out for free & generously

Question: What happened with EUA prices in Phase I ?

Goal concerning the Carbon market: Decreasing volumes

Emissions Trading Scheme = Phase III 2013 - 2020

40 per cent of allowances are being auctioned and power generators have to buy all of their allowances (with exceptions in some member states)

Reasons for the 2018 developments

- Anticipation of the start of the Market Stability Reserve (MSR) from 1 January, 2019. The MSR introduces supply-side flexibility to ensure that prices remain within an acceptable bandwidth.

- Between 2019 and 2023, the amount of allowances put in the reserve will double to 24% of the allowances in circulation. The regular feeding rate of 12% will be restored as of 2024.

- To achieve the EU's overall greenhouse gas emissions reduction target for 2030, the sectors covered by the EU Emissions Trading System (EU ETS) must reduce their emissions by 43% compared to 2005 levels.

Companies with KYOS software

Cargill KYOS

Client CASE - Cargill



Tom Schurmans - **Sr. Group Specialist 'Energy Optimisation'**

ng the world *thrive*

Founded 150 years ago.

Privately held.

Plan and investing through a long-term lens, focused on the future.

Cargill KYOS

155,000

employees

Located in

70

countries

Speaking

65+

languages

And over

150

Years of experience

Cargill KYOS

Our Purpose:

To be the leader in nourishing the world in a safe, responsible and sustainable way.

Our Vision:

To be the most trusted partner in agriculture, food and nutrition.

We operate within four key business segments:

Food

We provide food and beverage manufacturers, food service companies and retailers with high-quality ingredients, meat and poultry products, and health-promoting ingredients and ingredient systems.

Agriculture

We buy, process and distribute grain, oilseeds and other commodities to makers of food and animal nutrition products. We also provide products and services to crop and livestock producers.

Financial

We provide our food, agricultural, industrial and financial customers around the world with risk management and financial solutions.

Industrial

We serve industrial users of salt, starch and steel products. We also develop and market sustainable products made from agricultural feedstocks.

Cargill's five-year financial overview

Dollars in millions	2018	2017	2016	2015	2014
Sales and other revenues	$ 114,695	$ 109,699	$ 107,164	$ 120,393	$ 134,872
Adjusted operating earnings	$ 3,204	$ 3,035	$ 1,642	$ 1,926	$ 1,885
Net earnings	$ 3,103	$ 2,835	$ 2,377	$ 1,583	$ 1,822
Cash flow from operations	$ 5,223	$ 4,693	$ 3,410	$ 3,819	$ 3,767

All figures are denoted in U.S. dollar currency.

* Cargill reports financial results in accordance with U.S. generally accepted accounting principles (GAAP). The company also reports adjusted operating earnings, a non-GAAP financial measure that provides additional insight into the underlying financial performance of Cargill's ongoing operations.

Cargill's financial ranking in the U.S.

2018 FORTUNE 500 ranking of largest U.S. corporations (Revenue in U.S. $ billions)	
1. Walmart	500.3
2. Exxon Mobil	244.4
3. Berkshire Hathaway	242.1
4. Apple	229.2
5. UnitedHealth Group	201.2
6. McKesson	198.6
7. CVS Health	184.8
19. Walgreens Boots Alliance	118.2
Cargill	114.7[1]
20. JP Morgan Chase	113.9

1 Fiscal year ended May 31, 2018

Source: http://fortune.com/fortune500/,

Sustainability
—
Cargill

Connecting our global food system to nourish the world and protect the planet

Cargill is working to nourish the world in a safe, responsible and sustainable way. We've been in business for more than 150 years and have a history working with partners to navigate our complex food system from field to table.

INFORMATION & NEWSLETTER
https://www.cargill.com/sustainability

Cargill sets new goal to address climate change

As our company grows, emissions will go down.

February 01, 2018

Imagine taking 270,000 U.S. cars off the road for a year. Or cutting the emissions of someone flying roundtrip between New York and Shanghai 300,000 times. With a new commitment to tackle climate change, that's roughly the same amount of greenhouse gas emissions Cargill will cut from its operations annually by 2025.

Building on nearly 20 years of climate action, Cargill has committed to reduce absolute greenhouse gas (GHG) emissions in our operations by a minimum of 10 percent by 2025, against a 2017 baseline. That means that even as our business grows, our emissions will shrink.

Cargill's commitment is aligned with science-based targets, which are intended to keep the global rise in temperature below 2 degrees Celsius, and encompasses emissions in our operations, known as Scope 1 and 2 emissions. This translates to reductions of about 1.25 million metric tons of carbon dioxide equivalents (CO2e) each year.

Energy Transition

Impact on corporate risks

Switch to low GHG sources:

- (V)PPA's for wind, solar, fixed price, 10 – 2

Convert primary energy more efficiently:

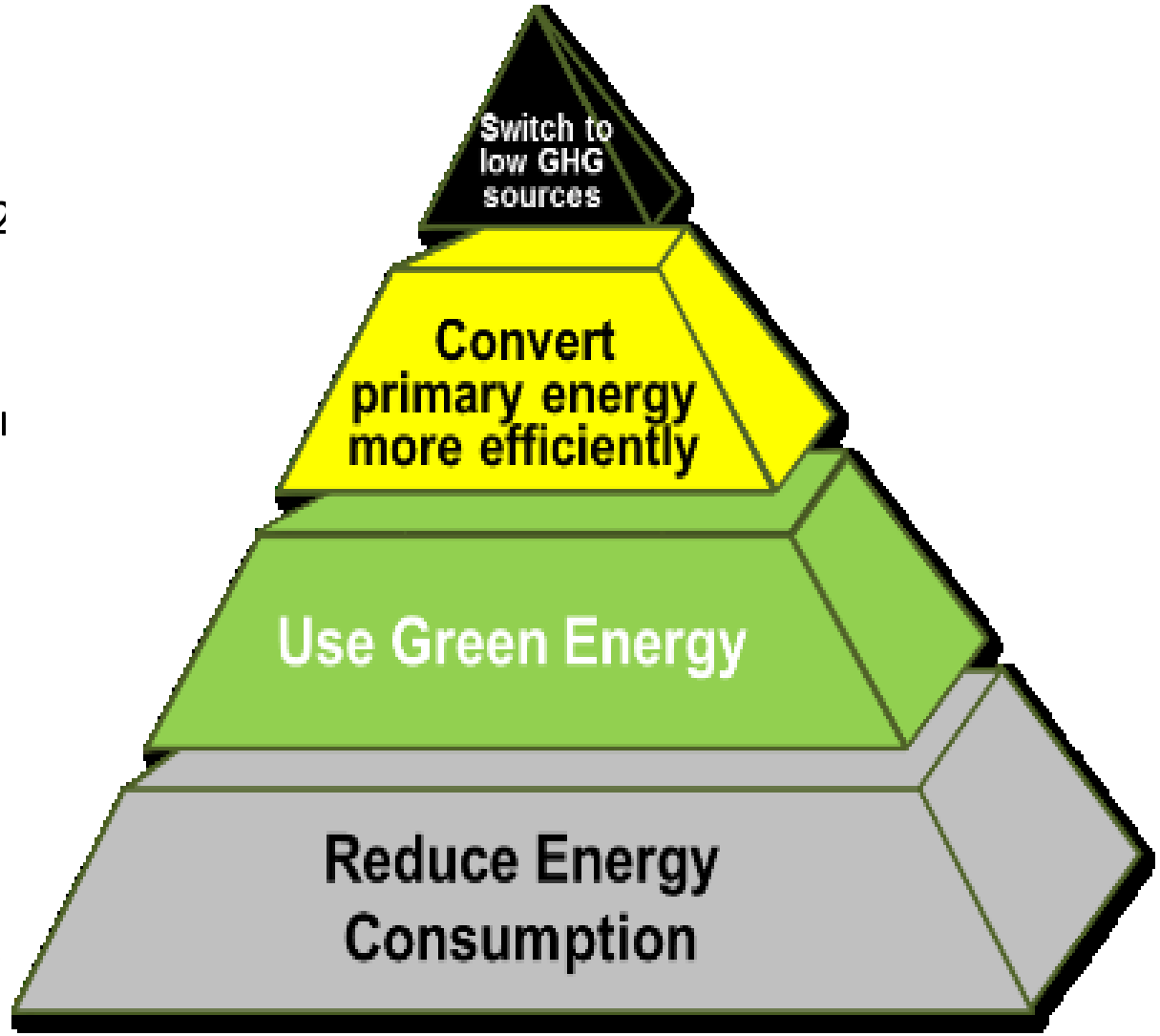
- Cogeneration technology, 20 yr investmer

Use Green Energy:

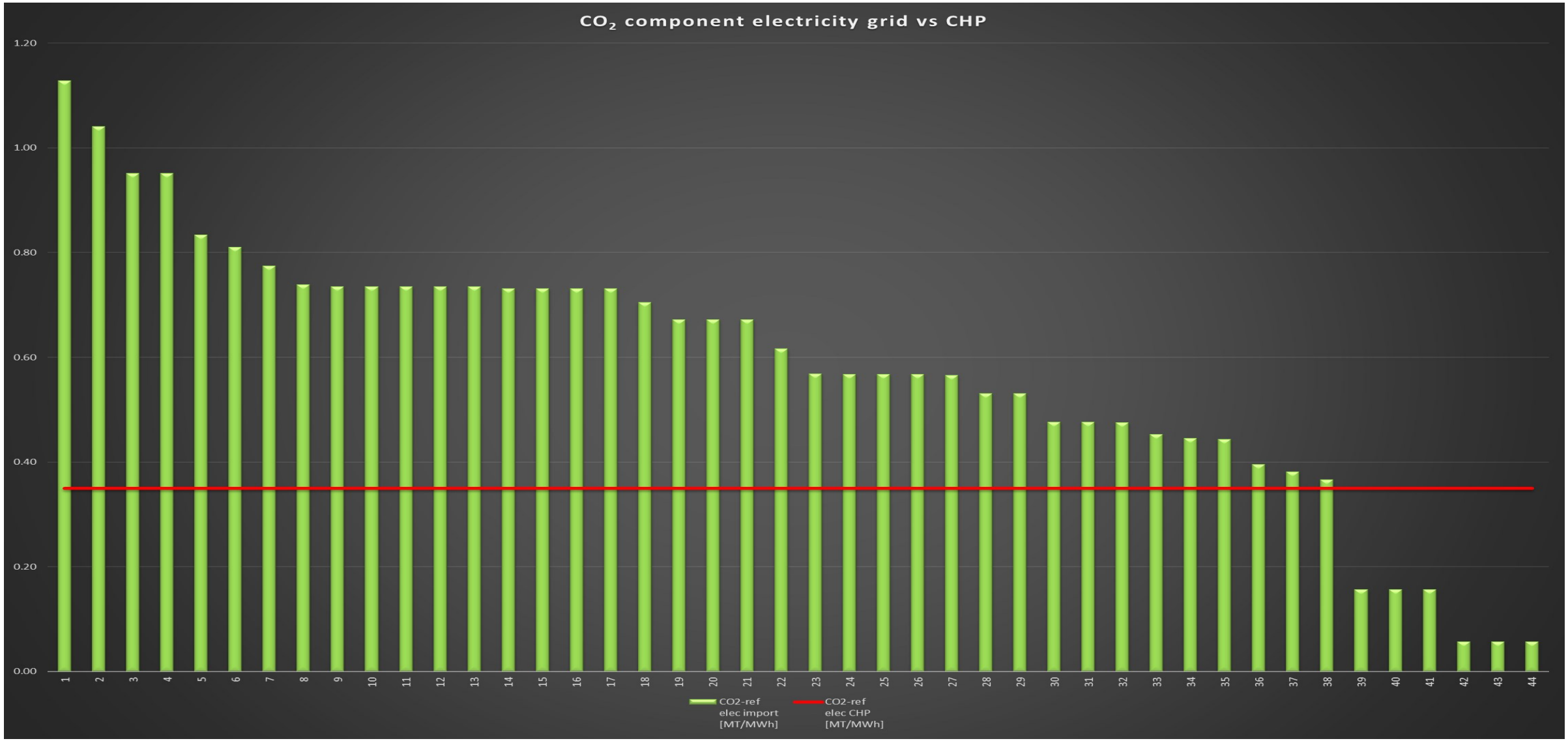
- Electrification, biomass, biofuels, on-site renewable

Reduce Energy Consumption:

- European industry is ahead!
- Energy is/was high cost – good paybacks!



Electrification? Invest in CHP? Invest in solar/wind?



Risk Management
—
Cargill

Risk identification & Measurement

Governance by Corporate Committees

- Counterparty Risk – Credit Risk:
  - Credit Lines & Credit Watch;
  - If no alternative supplies – Security of Supply

- Political Risk:
  - Energy Policies (Energy Transition, EU: ETS, Subsidies,…)

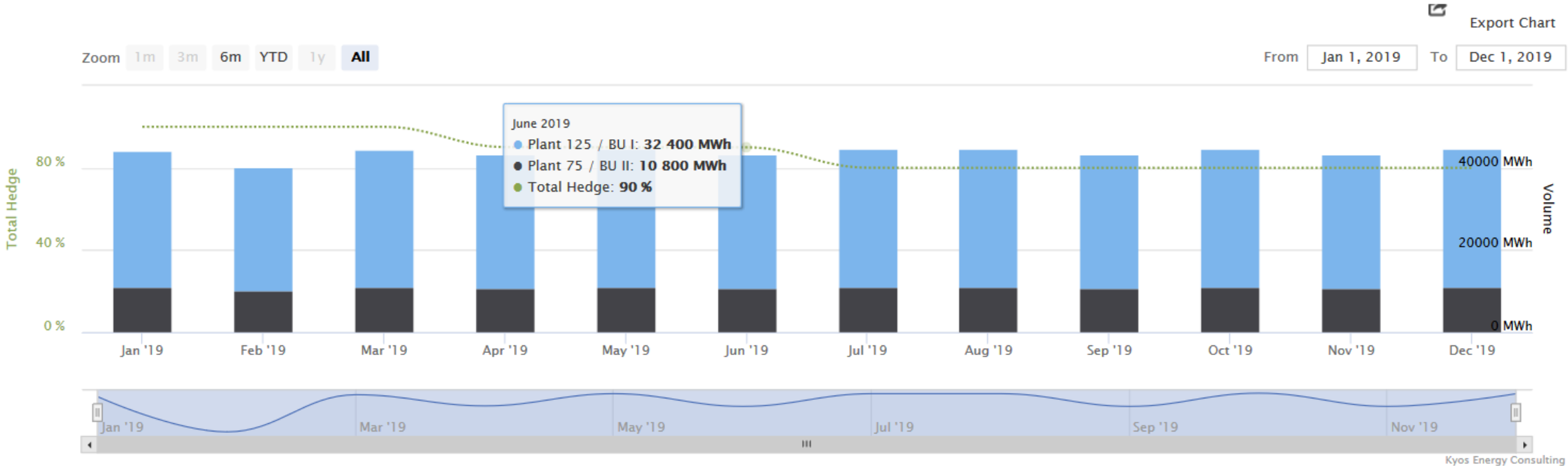
- Security of Supply:
  - Supplier of last resort and alternative fuels – investments

- Commodity Price Risk:
  - Risk Policy
  - Risk Management
  - Hedging vs Trading
  - Risk-Reward

Risk Cycle


Production / Budget / Sales
Forecast Energy Costs
Energy Consumption
Risk Cycle
Risk Management
Commodity Exposure – Price Risk

Expected consumption - Committed Sales



		Unit	Total	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019	Oct 2019	Nov 2019	Dec 2019
Plant 125 / BU I	Latest known	MWh	393 930	33 210	30 240	33 390	32 445	33 480	32 400	33 480	33 480	32 400	33 525	32 400	33 480
Plant 75 / BU II	Latest known	MWh	131 310	11 070	10 080	11 130	10 815	11 160	10 800	11 160	11 160	10 800	11 175	10 800	11 160
TOTAL	**Latest known**	**MWh**	**525 240**	**44 280**	**40 320**	**44 521**	**43 259**	**44 640**	**43 200**	**44 640**	**44 640**	**43 200**	**44 700**	**43 200**	**44 640**

Energy consumption per plant (Cargill operates >100 plants)

From Committed sales to "To be hedged"

Hedging strategy | Hedge prices | Physical | Financial

Physical positions

			2019											
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	MWh	525 600	44 640	40 320	44 520	43 260	44 640	43 200	44 640	44 640	43 200	44 700	43 200	44 640

Hedge strategy

		2019											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	%	100.00	100.00	100.00	90.03	90.00	90.00	80.00	80.00	80.00	80.00	80.00	80.00

To be hedged

		2019											
	Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	MWh 459 498	44 640	40 320	44 520	38 946	40 176	38 880	35 712	35 712	34 560	35 760	34 560	35 712

Physical contracted positions

				2019											
				Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	Fixed price	MWh	210 240	17 856	16 128	17 832	17 280	17 856	17 280	17 856	17 856	17 280	17 880	17 280	17 856
		Floating price	MWh	315 360	26 784	24 192	26 688	25 980	26 784	25 920	26 784	26 784	25 920	26 820	25 920	26 784

Cargill KYOS

Exposure minus Financial Hedges = Residual Risk

Hedging strategy | Hedge prices | Physical | Financial

Total financial position

					2019											
				Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	Floating price	MWh	-315 360	-26 784	-24 192	-26 688	-25 980	-26 784	-25 920	-26 784	-26 784	-25 920	-26 820	-25 920	-26 784

Financial contracted positions

					2019											
				Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	Fixed price	MWh	214 620	18 228	16 464	18 204	17 640	18 228	17 640	18 228	18 228	17 640	18 253	17 640	18 228

Financial contracted cash flows

					2019											
				Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	Fixed price	EUR	-4 038 360	-342 984	-309 792	-342 523	-331 920	-342 984	-331 920	-342 984	-342 984	-331 920	-343 445	-331 920	-342 984
		Floating price	EUR	5 156 943	475 824	430 056	469 250	419 373	420 265	401 028	412 135	411 406	406 690	432 292	429 869	448 755

Residual risk

					2019											
				Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	Floating price	MWh	-100 740	-8 556	-7 728	-8 485	-8 340	-8 556	-8 280	-8 556	-8 556	-8 280	-8 568	-8 280	-8 556

Mind you….Residual risk is different than the hedging strategy

Cargill KYOS

Hedge overview : “To be hedged today”

Hedge strategy (hedge volume target)

				2019											
			Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]		MWh	459 498	44 640	40 320	44 520	38 946	40 176	38 880	35 712	35 712	34 560	35 760	34 560	35 712

Physical hedge

				2019											
			Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	MWh	210 240	17 856	16 128	17 832	17 280	17 856	17 280	17 856	17 856	17 280	17 880	17 280	17 856

Financial hedge

				2019											
			Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	MWh	214 620	18 228	16 464	18 204	17 640	18 228	17 640	18 228	18 228	17 640	18 253	17 640	18 228

To be hedged today

				2019											
			Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]		MWh	34 638	8 556	7 728	8 485	4 026	4 092	3 960	-372.00	-372.00	-360.00	-372.50	-360.00	-372.00

Underhedged

Overhedged

Cargill KYOS

Hedge effects - benchmarking

Hedging strategy | Hedge prices | Physical | Financial

All physical contracts

				2019											
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	EUR / MWh	21.92	23.16	23.17	22.96	21.77	21.33	21.14	21.07	21.04	21.33	21.71	22.12	22.27

Fixed physical contracts

				2019											
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	EUR / MWh	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75

Financial contracts

				2019											
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	EUR / MWh	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00

Physical & financial contracts

				2019											
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	EUR / MWh	19.46	19.85	19.86	19.78	19.41	19.27	19.21	19.18	19.18	19.27	19.39	19.52	19.57

Suggestion: What are the results of hedging versus the “Benchmark”

Cargill KYOS

Energy Transition

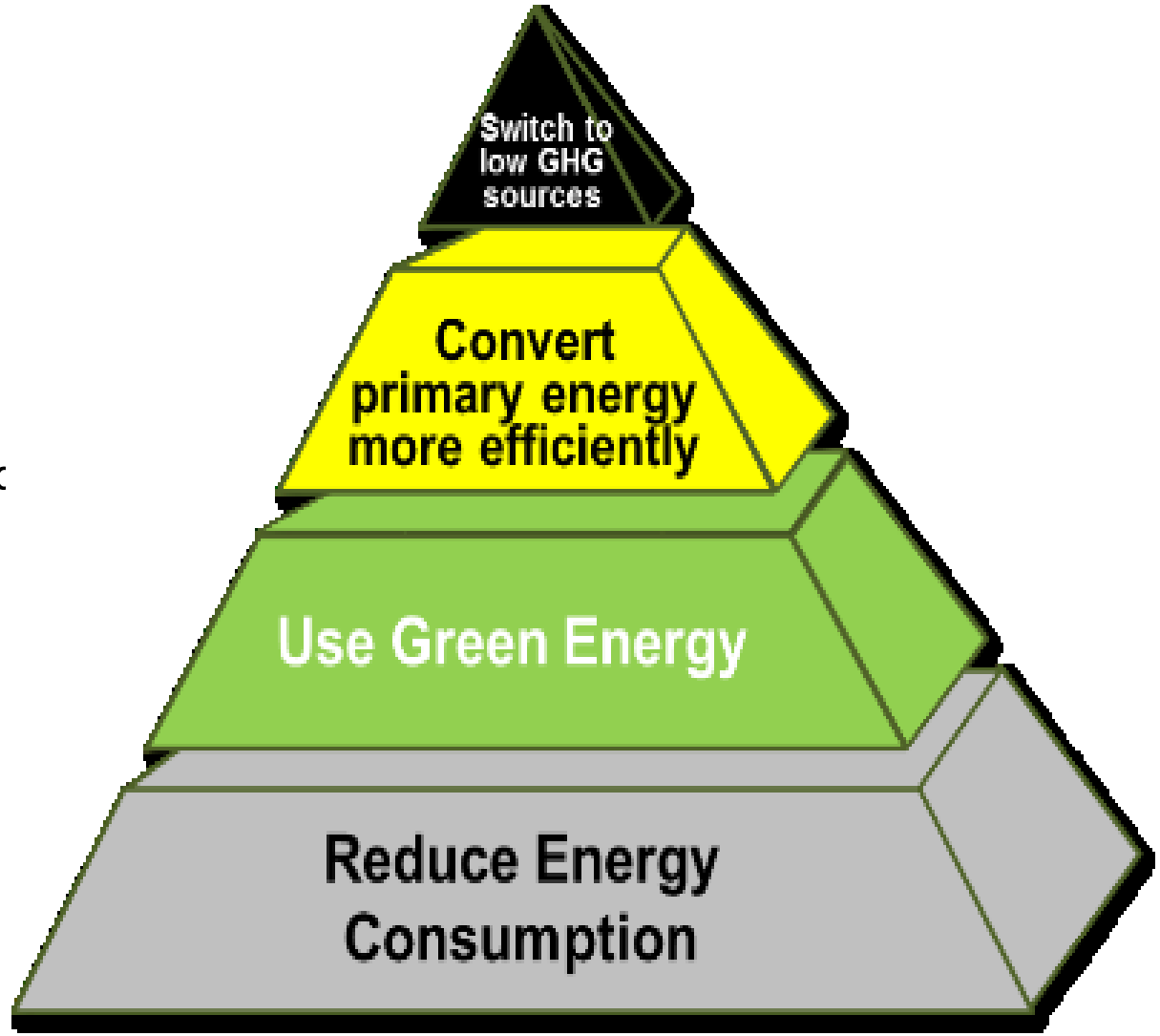
Impact on corporate risks

Switch to low GHG sources:
- (V)PPA's for wind, solar, fixed price, 10 – 20
- Credit Risk? Commodity Risk?

Convert primary energy more efficiently:
- Cogeneration technology, 20 yr investment
- Consumer with producer risks (spark spread

Use Green Energy:
- Electrification, biomass, biofuels, on-site renewable
- Availability? Market? Price Risk? PPA?

Reduce Energy Consumption:
- European industry is ahead!
- Energy is/was high cost – good paybacks!



Cargill KYOS

CASE

Case study : Beverage Producer

- Can packaging 36,000 MT
- EUA 60,000 MT
- Wheat 240,000 MT
- Natural Gas 1,010,160 MWh

Date	Legal entity	Counterparty	Period	Commodity	B/S	Volume	FX
2017-10-19	Beverage Producer	ALPIQ	Jan'20 - Dec'20	EUA Carbon	buy	60000 Ton	EUR
2017-10-19	Beverage Producer	Newedge	Jan'20 - Dec'20	Wheat (Milling Wheat)	buy	240000 MT	EUR
2017-10-19	Beverage Producer	Eneco	Jan'20 - Dec'20	TTF	buy	1010160 MWh	EUR
2017-10-19	Beverage Producer	Can Pack Group	Jan'20 - Dec'20	Aluminium (EUR)	buy	36000 MT	EUR

Risk policy will help you to….

Be prepared if ……what can happen ……happens

- sales will change …
- supplier cannot deliver …
- a mistake (of course not yours)…
- Unexpected market price movements …

Murphy's law…

Create a clear format of risk analysis

Cash flow based upon current market prices is the starting point

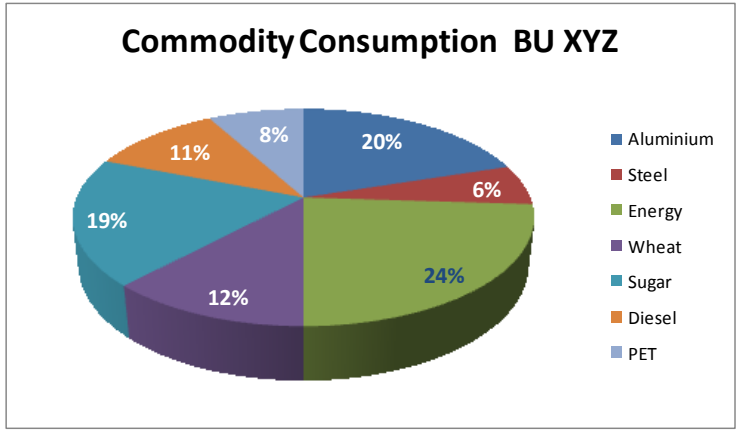
- Stress testing (volume and prices)
- Value-at-Risk (VaR)
- Cash flow-at-Risk (CfaR)

Leading to a widely accepted Risk Policy (See also the ***Cargill Risk Cycle***)

How to start

Base case study :

- Underlying commodities & currencies
- Base case scenario = 100% Fixed
- Current market prices (EUA 21)



Cash flow		2020
Aluminium (EUR)	EUR	-62,765,637
EUA Carbon	EUR	-1,260,881
TTF	EUR	-18,295,378
Wheat (Milling Wheat)	EUR	-43,752,500
Total	EUR	-126,074,396

Starting point

Initial “quick scan” stress testing

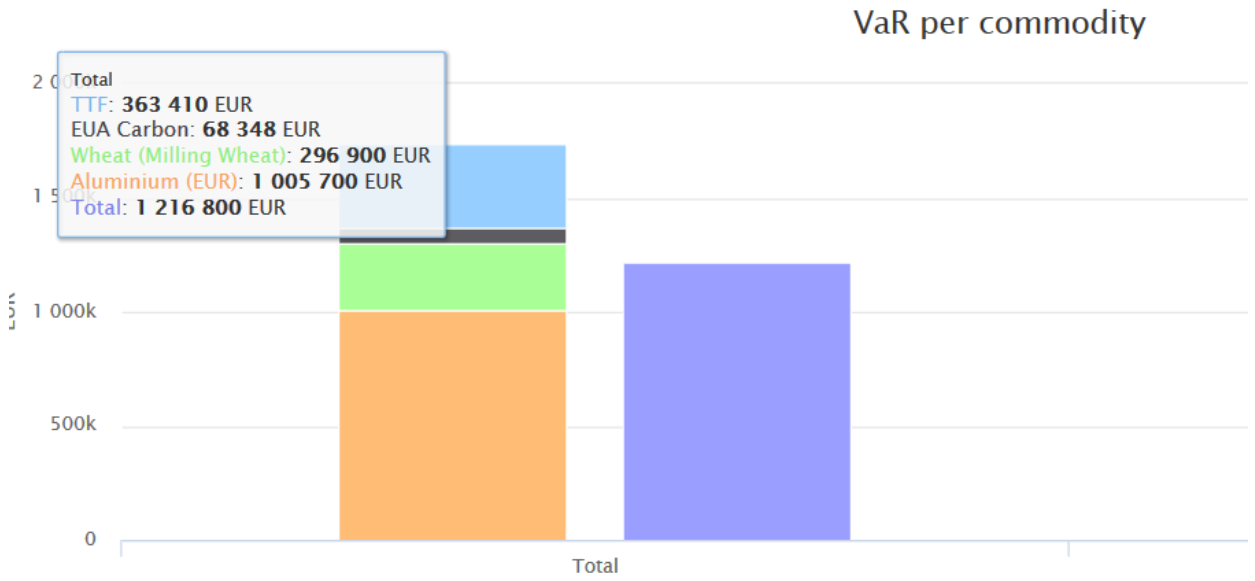
What happens if prices rise with 10%

What about the competition – Carbon leakage

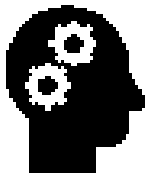
Cargill KYOS

Bring statistics into practise = Value-at-Risk

VaR : aluminium, gas, wheat, EUA



Annualized Volatility	…
* Underlying Price	…
* Confidence-Level	95%
* √ Risk period	1 day



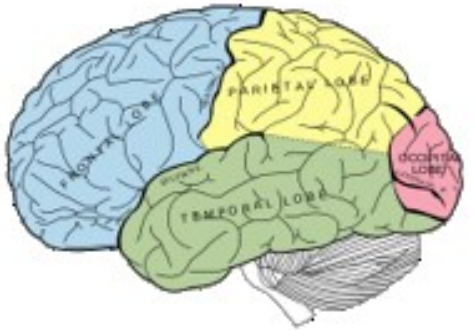
1 day VaR	EUR 1.216.800	(Total is lower then individual components)

Cargill KYOS

From short to long term risk assesments

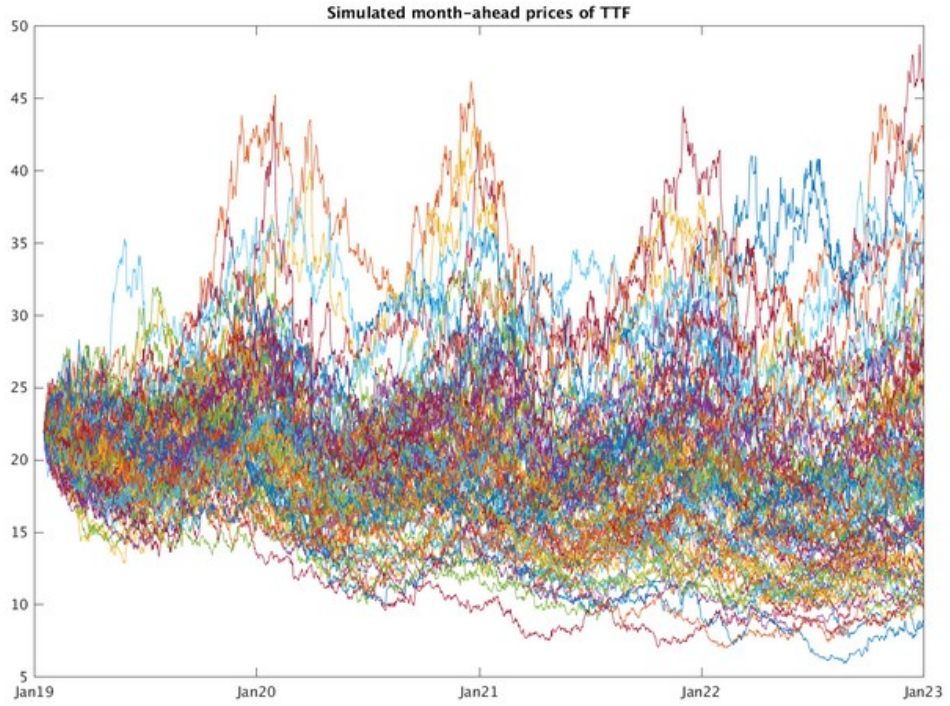
We calculated that a 1 day VaR is approximately EUR 1.216.800

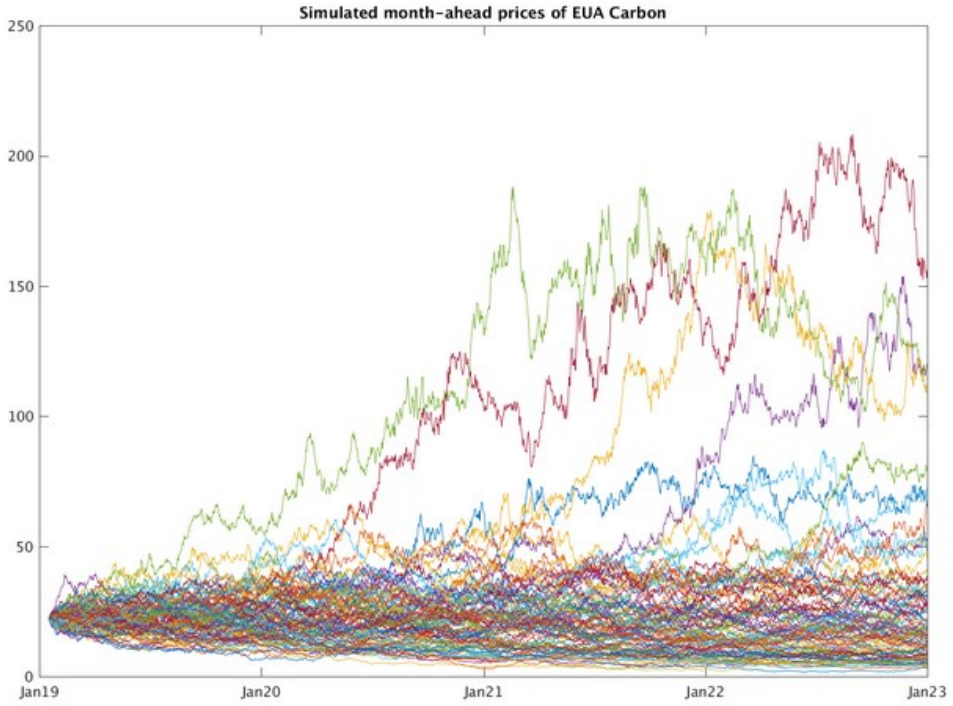
A budget forecast has to be given for e.g. 2020 and not for 1 day



CfaR is used for Long term risk assesments

Monte Carlo price simulations for Natural Gas (TTF) and EUA





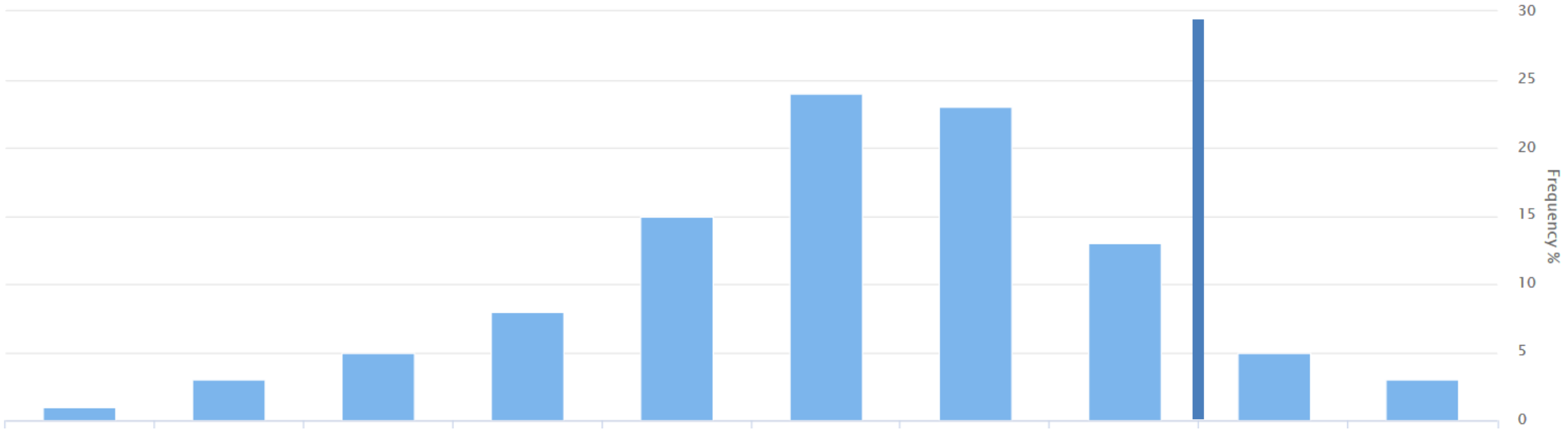
Some markets (like Natural Gas) have **“seasonality”**

KYOS analytics…..Your advantage for long term assessments

Aluminium (EUR)	EUR	-62,765,637
EUA Carbon	EUR	-1,260,881
TTF	EUR	-18,295,378
Wheat (Milling Wheat)	EUR	-43,752,500
Total	EUR	-126,074,396

Earnings at Risk | Cash-flow at Risk | Volumes at Risk

Cash-flow at Risk Summary	Currency	95% at Risk
Total	EUR	29,611,210



Distribution of expected costs

Caron (EUA) = small position but largest spread

Commodity	Currency	Avg	1%	5%
EUA Carbon	**EUR**	**-1,364,809**	**-5,170,270**	**-2,912,117**
TTF	EUR	-19,384,284	-30,241,209	-26,397,624
Aluminium (EUR)	EUR	-62,262,974	-103,354,704	-89,016,272
Wheat (Milling Wheat)	EUR	-43,752,500	-64,407,974	-54,254,624

Be prepared: Electrification = rising volatility

EUA Carbon price forecasting – more then just figures

Realized business values

- Consistency & transparancy
- Procurement - Sales - Finance & Treasury
- Uncertainty translated into EUR

Repeat the risk analyses – ongoing process

- Fixed versus Floating positions
- Cashflow based upon current forward prices
- Short term and Long term cashflow distribution
- Budget versus current forecasts
- Hedging strategy (also in terms of hedge products)

Energy Transition

—

Risk Impact

Thank you

Richard Cornielje
KYOS

&

Tom Schurmans
Cargill

www.kyos.com

cornielje@kyos.com

www.cargill.com

tom_schurmans@cargill.com