



Japan Power

Energy Risk Management

October 2023



part of eex group

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Speaker – Dr Chris Strickland
CCO and Co-Founder of Lacima





Lacima provides multi-award-winning trading, valuation, optimisation and risk management software for global energy and commodities players

“Empowering confident decision making for energy and commodity market participants through superior innovative analytics”



Company overview

- ▶ **LACIMA** - Founded in 2001, by Dr Chris Strickland and Dr Les Clewlow, both regarded as experts and thought-leaders in energy and commodity market modelling
- ▶ **AWARD WINNING ANALYTICS SOFTWARE** - Lacima provides multi-commodity, multi-currency and multi-geography trading, valuation, optimisation and risk management software
- ▶ **INTEGRATED ANALYTICS ENGINES** – Fully integrated analytics engines with industry acclaimed models and methodologies powers multiple user interfaces, fulfilling the needs of different user groups (including FO and MO)
- ▶ **TEAM** – Deeply experienced, highly regarded quantitative team of analysts and developers
- ▶ **GLOBAL CLIENT BASE** – long term relationships with clients with interests in power, gas, LNG, crude, agriculture, metals across UK, Europe, Middle East, Africa, North and South America, Asia and ANZ
- ▶ **SHAREHOLDERS** – Since early 2022, Lacima has been owned by EEX Group





What constitutes best in class Risk Management?

- ▶ In any company, the role of risk management is to:
 - ▶ Identify and evaluate the risks faced by the firm
 - Power, gas, load, wind, solar, spreads, etc.
 - ▶ Communicate these risks to senior management
 - ▶ Monitor and manage those risks in a way that ensures the firm bears only the risks to which its management and board want exposure

- ▶ To guide them in monitoring and managing risk, ‘best in class’ risk management companies perform a number of types of analysis:
 - ▶ Margin calculations and ‘what-if’ analysis
 - ▶ Mark to market of current portfolio
 - ▶ P&L attribution between one day and the next
 - ▶ Market risk metrics (e.g. VaR or EaR)
 - ▶ Credit risk metrics (e.g. PFE)



What constitutes best in class Risk Management?

- ▶ In the past decade developments in the energy & commodity markets have highlighted the risks and volatility inherent in this marketplace – focussing attention on the systems that record the company’s activities and support their decision making – the C/ETRM systems
- ▶ Effective risk management will become even more complex and challenging, yet will be a critical precondition of profitability and growth, for energy market participants
 - ▶ Isolated national markets are mutating into one market connected through different links & business processes via globalization
 - ▶ M&A activities are leading to the emergence of companies conducting activities in many countries and segments of the energy complex
 - ▶ Energy price shocks are becoming a norm – spreading rapidly across regional markets and sectors of the energy chain
 - ▶ Trading scandals have the ability to write down billions of \$’s of value
- ▶ Effective risk management that allows companies to deal with these issues will be critical to energy market profitability and growth



What constitutes best in class risk Management?

Energy Trading and Risk Management (ETRM) systems

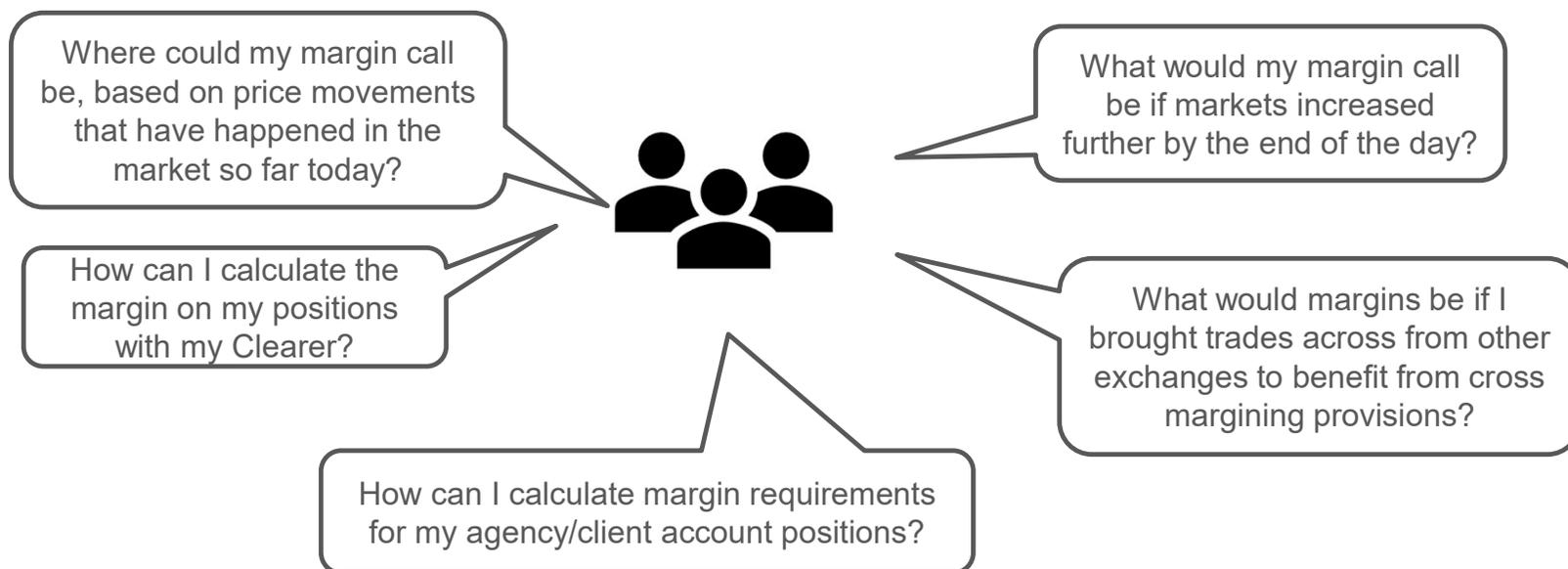


- Capturing and recording deals
- Scheduling physical commodity movements
- Tracking primary and secondary costs
- Monitoring inventory levels and costs
- Actualizing deal volumes
- **Calculation and 'what-if' analysis of Initial Margins**
- **Valuation ('Mark-to-market' of deals)**
- Calculating settlement amounts
- Generating invoices
- **Profit and Loss (P&L) attribution**
- Deal confirmation letters
- Payables and receivables
- **Market risk exposures (e.g. VaR, EaR, GMaR)**
- **Credit risk exposures (e.g. PFE)**



Margin calculations

- ▶ Recent high volatility has brought opportunities but also challenges - in particular, collateral requirements pose a major liquidity risk for market participants

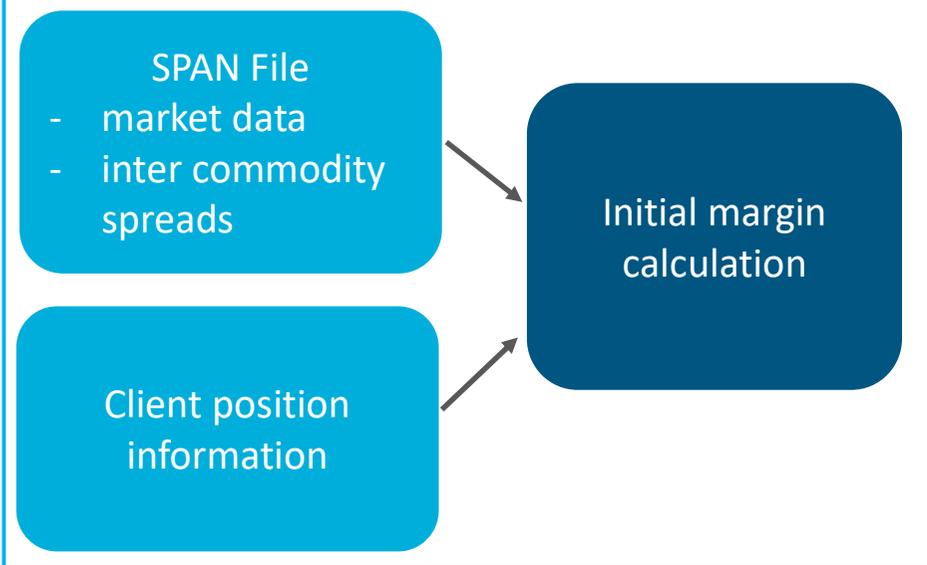


- ▶ Estimating margin requirements for current and potential portfolios provides greater confidence to hedge positions and to manage liquidity risks

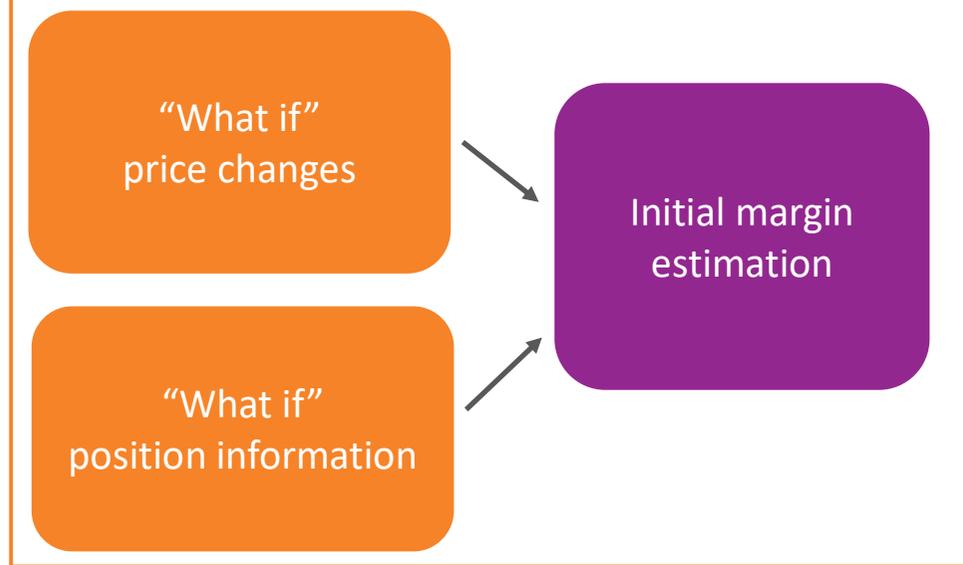


Margin – calculating what could happen

- ▶ Calculate initial margins on end-of-day positions using the ECC SPAN® file



- ▶ Option to extend to estimate margins based on changing prices and changing positions





Margin – Japanese Power example

SPAN Margin Report

23/02/2023 - Japan Power Portfolios

Inputs Positions Prices Contracts Margin Outputs Delta Outputs Position Outputs Messages Audit Log

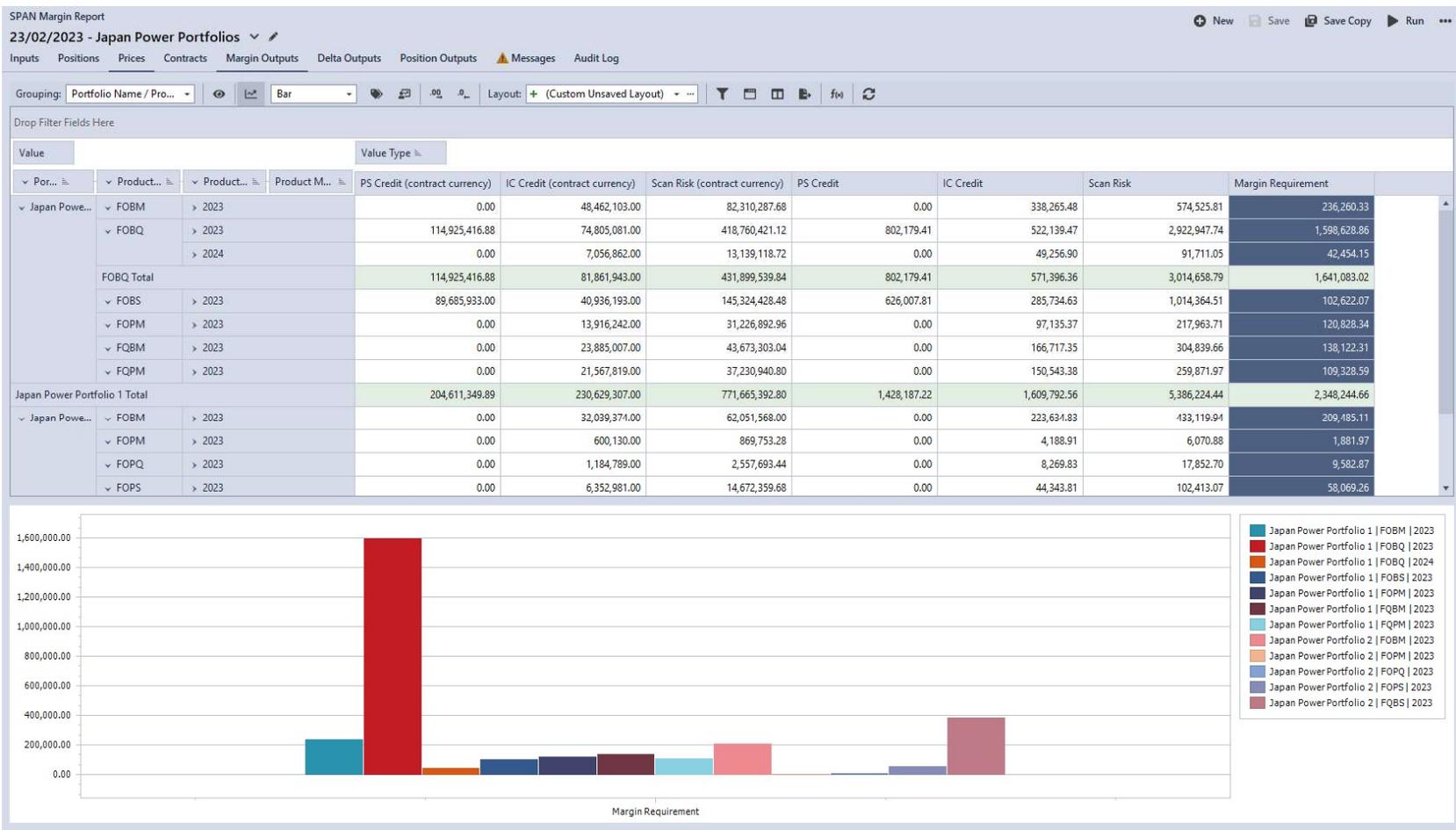
New Edit Refresh Total Contracts: 31

Drag a column header here to group by that column

Portfolio Name	Product ID	Long/Short	Start Date	End Date	Product Year	Product Month	Volume	Eff
Japan Power Portfolio 1	FOBS	Short	1/04/2023	30/09/2023	2023	4	-20.00	
Japan Power Portfolio 1	FOBM	Long	1/05/2023	31/05/2023	2023	5	3.00	
Japan Power Portfolio 1	FOPM	Long	1/02/2023	28/02/2023	2023	2	19.00	
Japan Power Portfolio 1	FOBS	Short	1/10/2023	31/03/2024	2023	10	-8.00	
Japan Power Portfolio 1	FOPM	Long	3/04/2023	28/04/2023	2023	4	10.00	
Japan Power Portfolio 1	FOBM	Long	1/02/2023	28/02/2023	2023	2	32.00	
Japan Power Portfolio 1	FQBM	Short	1/02/2023	28/02/2023	2023	2	-14.00	
Japan Power Portfolio 1	FQPM	Short	1/02/2023	28/02/2023	2023	2	-37.00	
Japan Power Portfolio 1	FQBM	Short	1/03/2023	31/03/2023	2023	3	-13.00	
Japan Power Portfolio 1	FOBQ	Long	1/04/2023	30/06/2023	2023	4	3.00	
Japan Power Portfolio 1	FOBQ	Short	1/10/2023	31/12/2023	2023	10	-2.00	
Japan Power Portfolio 1	FOBQ	Long	1/07/2023	30/09/2023	2023	7	29.00	
Japan Power Portfolio 1	FOBQ	Short	1/01/2024	31/03/2024	2024	1	-2.00	
Japan Power Portfolio 2	FOBS	Long	1/10/2023	31/03/2024	2023	10	7.00	
Japan Power Portfolio 2	FOBM	Long	1/03/2023	31/03/2023	2023	3	14.00	
Japan Power Portfolio 2	FQPM	Long	1/02/2023	28/02/2023	2023	2	7.00	
Japan Power Portfolio 2	FOPM	Short	1/03/2023	31/03/2023	2023	3	-1.00	
Japan Power Portfolio 2	FOBM	Short	1/04/2023	30/04/2023	2023	4	-10.00	

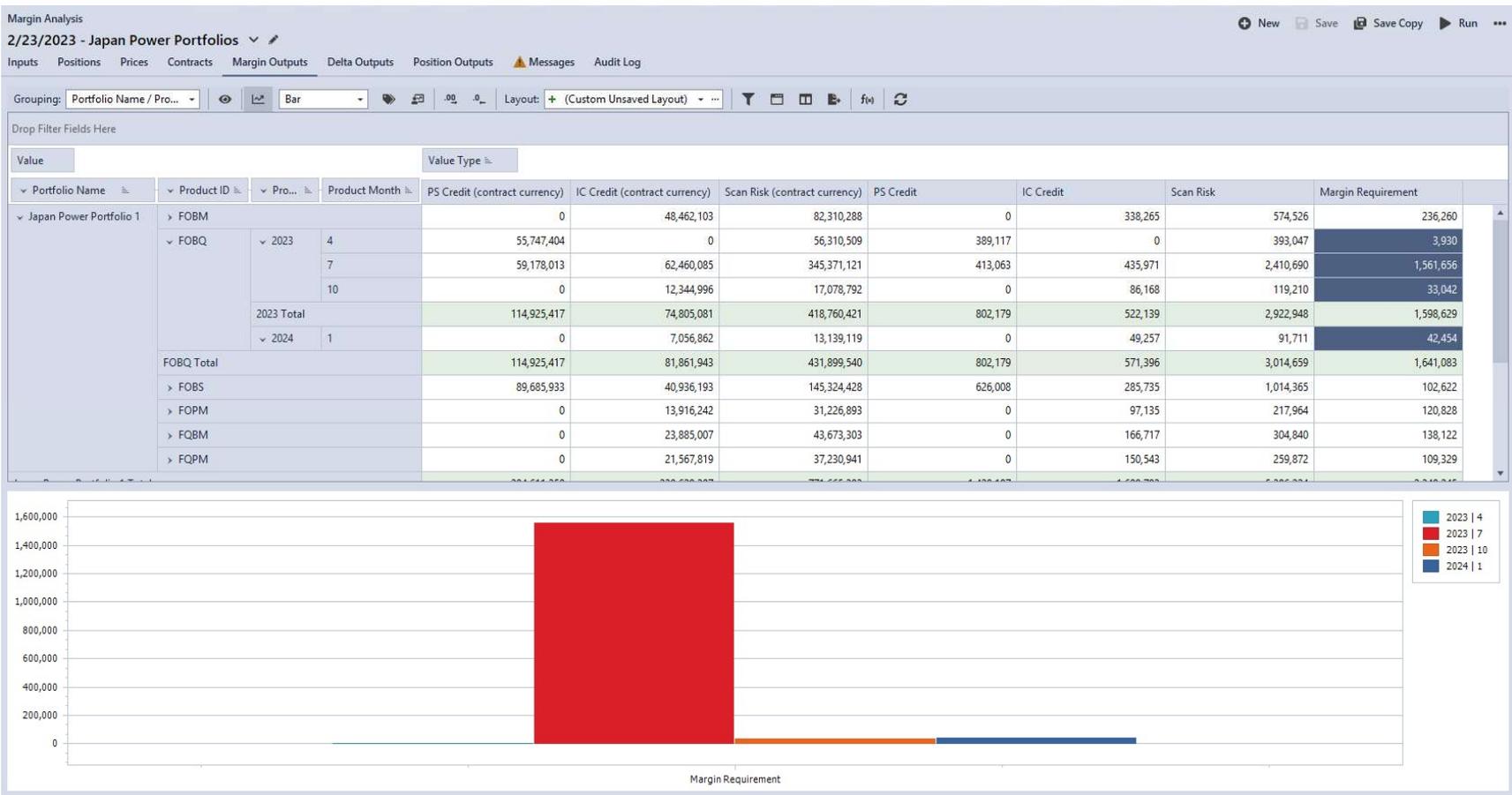


Margin – Japan Power example



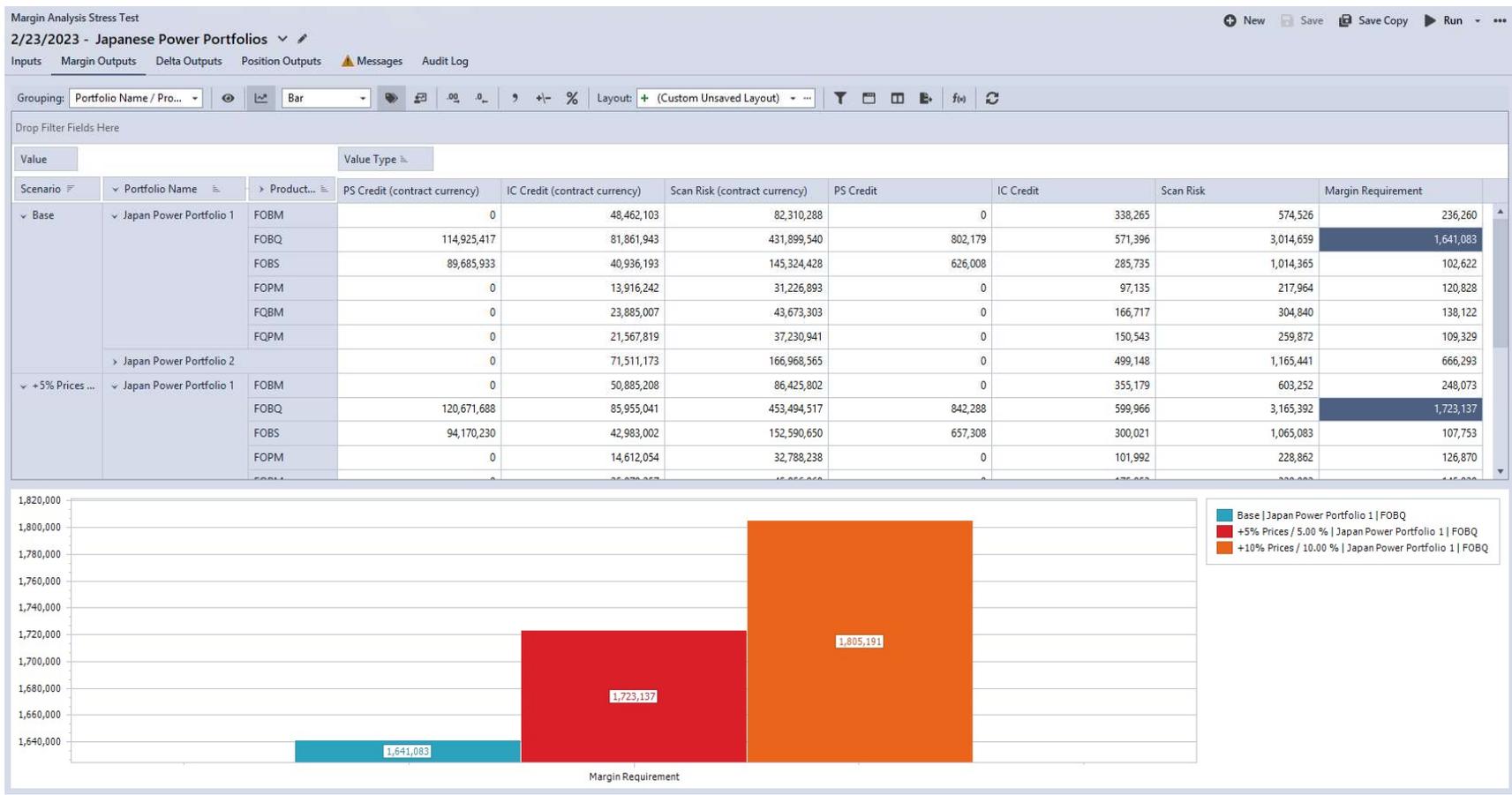


Margin – Japan Power example





Margin – Japan Power example

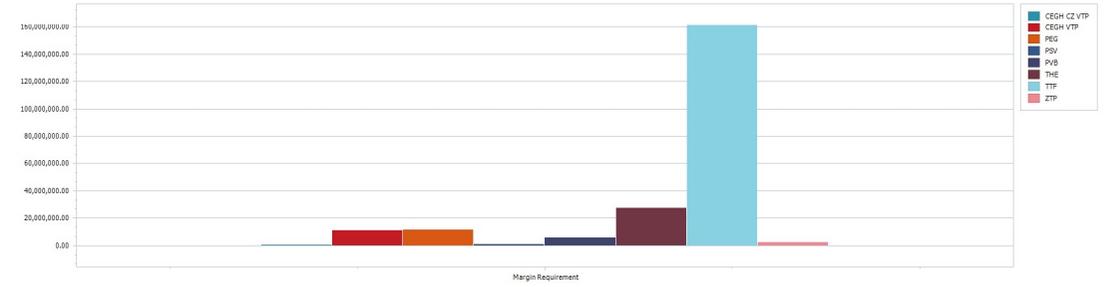
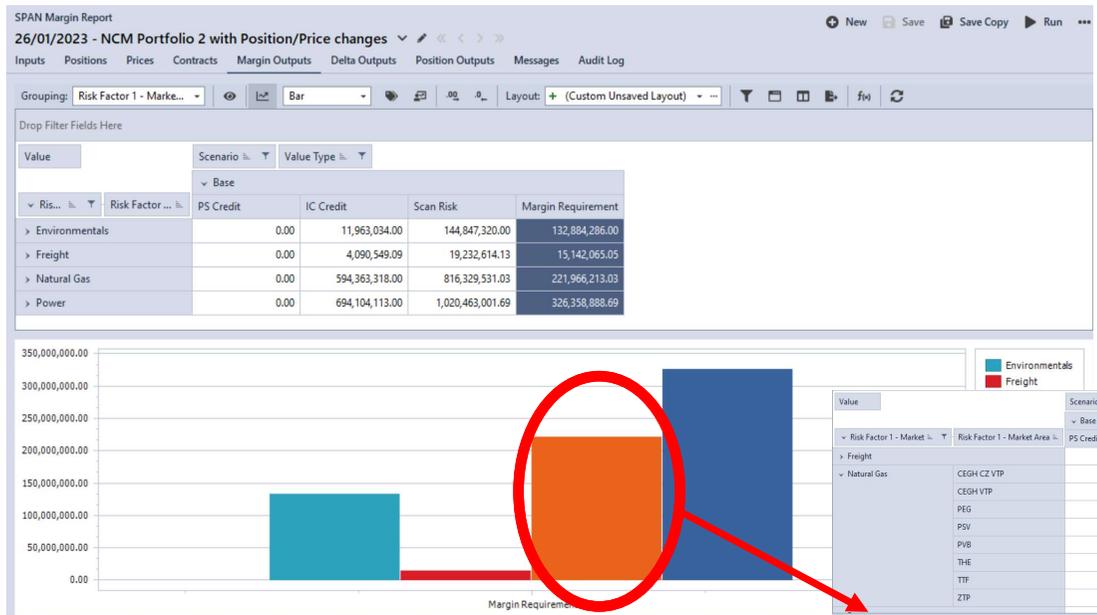


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Margin – Multi commodity example

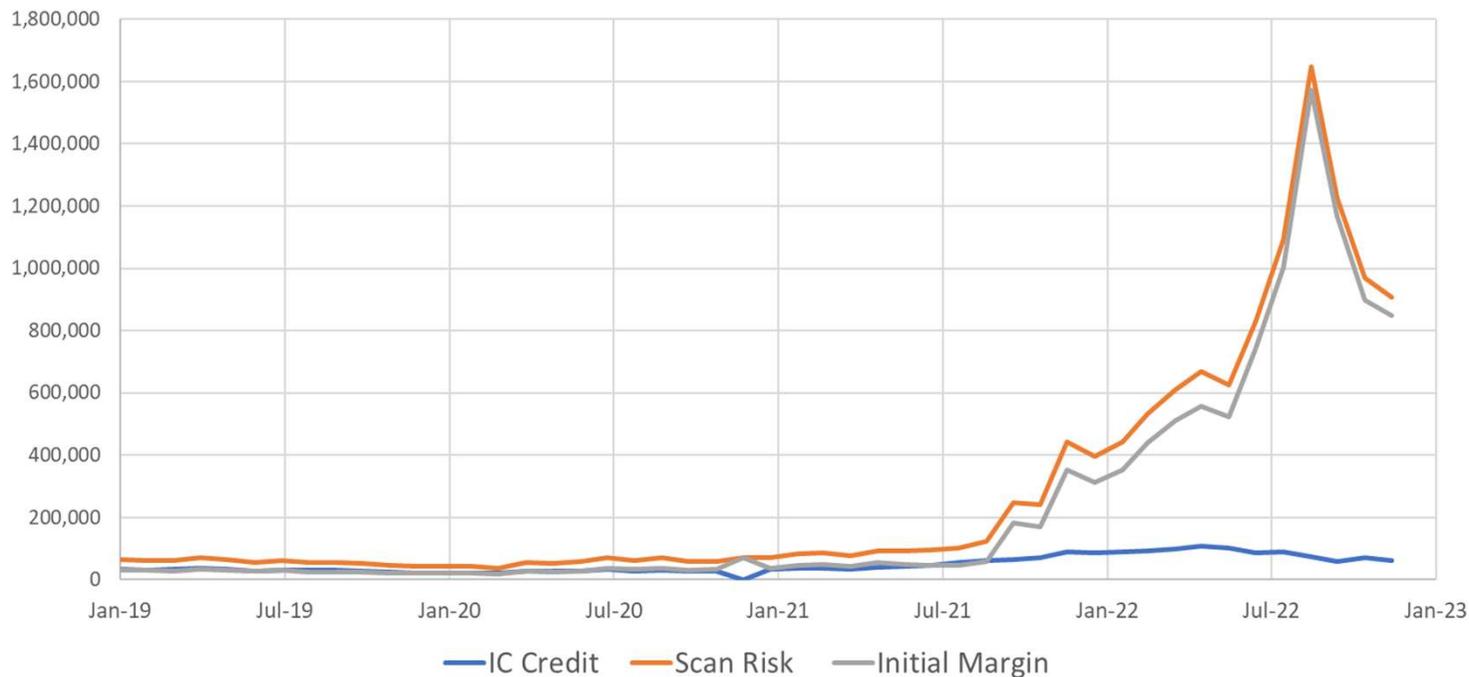




Margin history versus historical market movements

- ▶ Assess historical margin stresses and demands, driven by realised market movements on any given portfolio

Historic Margin Analysis





Mark to market of portfolios

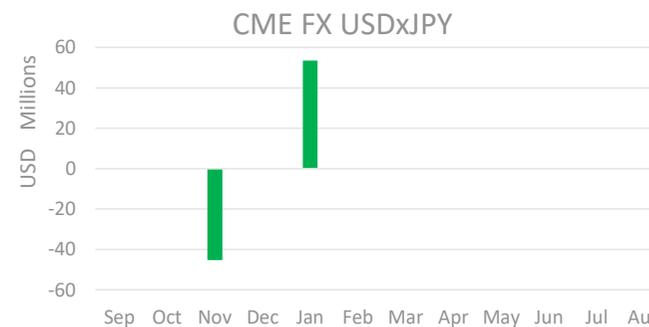
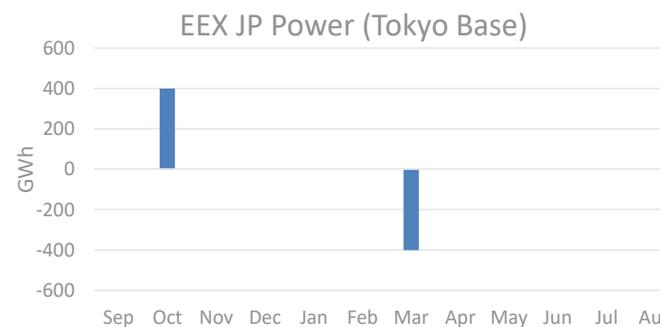
- ▶ Mark to market aims to provide a realistic appraisal of a company's current financial situation based on current market conditions.
- ▶ In trading, such as futures and options, are marked to market to show the current market value of these investments.
 - ▶ Mark to market is calculated by the revaluation of the instruments in the portfolio dependent on the market conditions at the end of the day
 - ▶ If a company had to liquidate its assets and pay off all its debts today, mark to market accounting would give you an accurate picture of how much it would be worth.



Mark to market of portfolios

Position as of Aug 30th 2023:

Month	Power [GWh]	LNG [MMBtu]	FX [USDxJPY]
Sep-23			
Oct-23	400		
Nov-23		-3,000,000	-45,219,000
Dec-23			
Jan-24		3,000,000	53,505,000
Feb-24			
Mar-24	-400		
Apr-24			



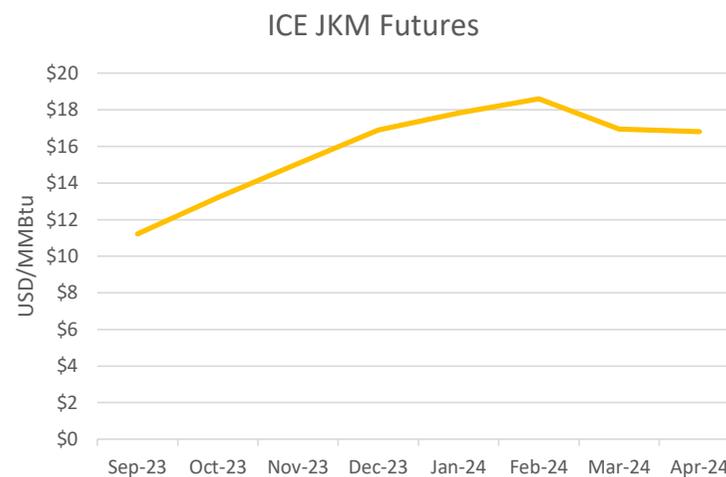
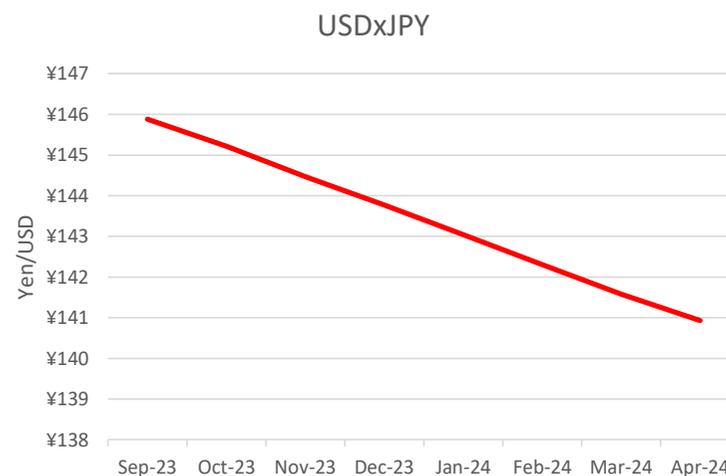
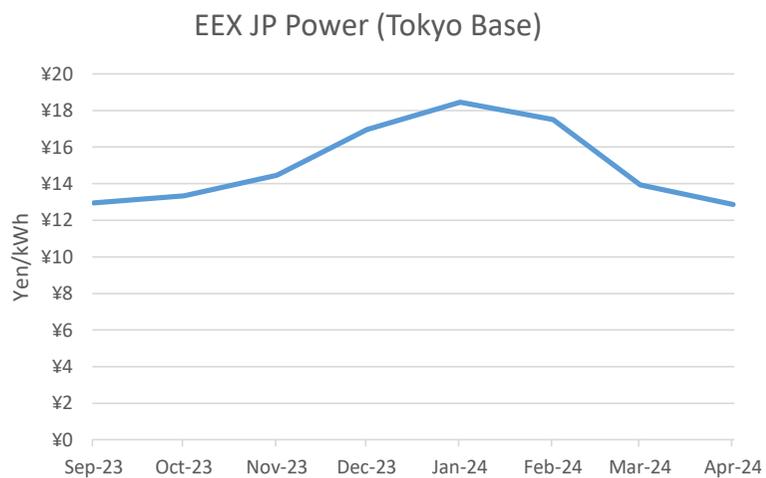


Mark to market of portfolios

Power: EEX Monthly JP Power Future (Tokyo)

LNG: ICE JKM (Japan Korean Marker) Future

FX: Bloomberg FX (USDxJPY)

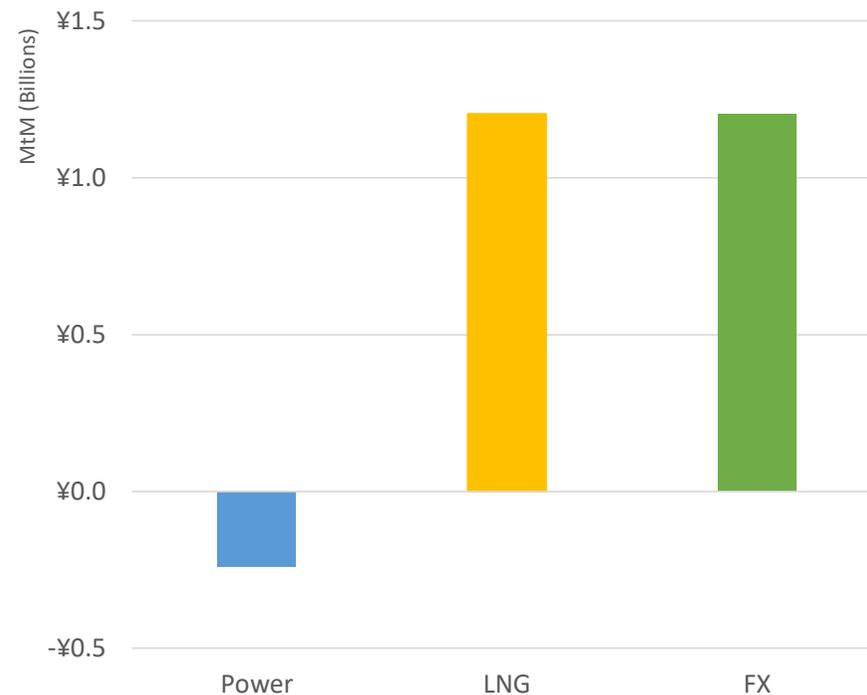




Mark to market of portfolios

Month	Power [¥ Million]	LNG [¥ Million]	FX [¥ Million]
Sep-23			
Oct-23	5,336		
Nov-23		-6,571	-6,571
Dec-23			
Jan-24		7,775	7,775
Feb-24			
Mar-24	-5,576		
Apr-24			

Total MtM as of Aug 30th 2023: **2.168b ¥**





Mark to market of portfolios

Valuation + New Save Save Copy

30/08/2023 - EEX JP Power Oct-23 ✕

Inputs Valuation Greeks Contracts Valuation Outputs Greek Outputs Messages Audit Log

Grouping: Contract ID Layout: + (Custom Unsaved Layout)

Drop Filter Fields Here

Value			Bucket Type	Contract ID					
Value ...	From	To	Monthly						
			EEX JP Power Tokyo Base Mar-24	EEX JP Power Tokyo Base Oct-23	FX USDxJPY Jan-23	FX USDxJPY Nov-23	ICE JKM Future Jan-23	ICE JKM Future Nov-23	
▼ Mark To M...	▼ 30/08/2023	31/08/2023	0.00	0.00	0.00	0.00	0.00	0.00	
	▼ 1/09/2023	30/09/2023	0.00	0.00	0.00	0.00	0.00	0.00	
	▼ 1/10/2023	31/10/2023	0.00	5,335,775,345.52	0.00	0.00	0.00	0.00	
	▼ 1/11/2023	30/11/2023	0.00	0.00	0.00	-6,571,225,080.00	0.00	-6,571,225,080.00	
	▼ 1/12/2023	31/12/2023	0.00	0.00	0.00	0.00	0.00	0.00	
	▼ 1/01/2024	31/01/2024	0.00	0.00	7,775,346,600.00	0.00	7,775,346,600.00	0.00	
	▼ 1/02/2024	29/02/2024	0.00	0.00	0.00	0.00	0.00	0.00	
	▼ 1/03/2024	31/03/2024	-5,575,850,339.87	0.00	0.00	0.00	0.00	0.00	
	▼ 1/04/2024	30/04/2024	0.00	0.00	0.00	0.00	0.00	0.00	
Mark To Market Total			-5,575,850,339.87	5,335,775,345.52	7,775,346,600.00	-6,571,225,080.00	7,775,346,600.00	-6,571,225,080.00	



Valuation – e.g. structured LNG deal

What it does

Analyse and value an LNG deal and each component of flexibility.

The LNG deal can have complex pricing formulae, including indexation, S-Curves and link to multiple commodities

Key features

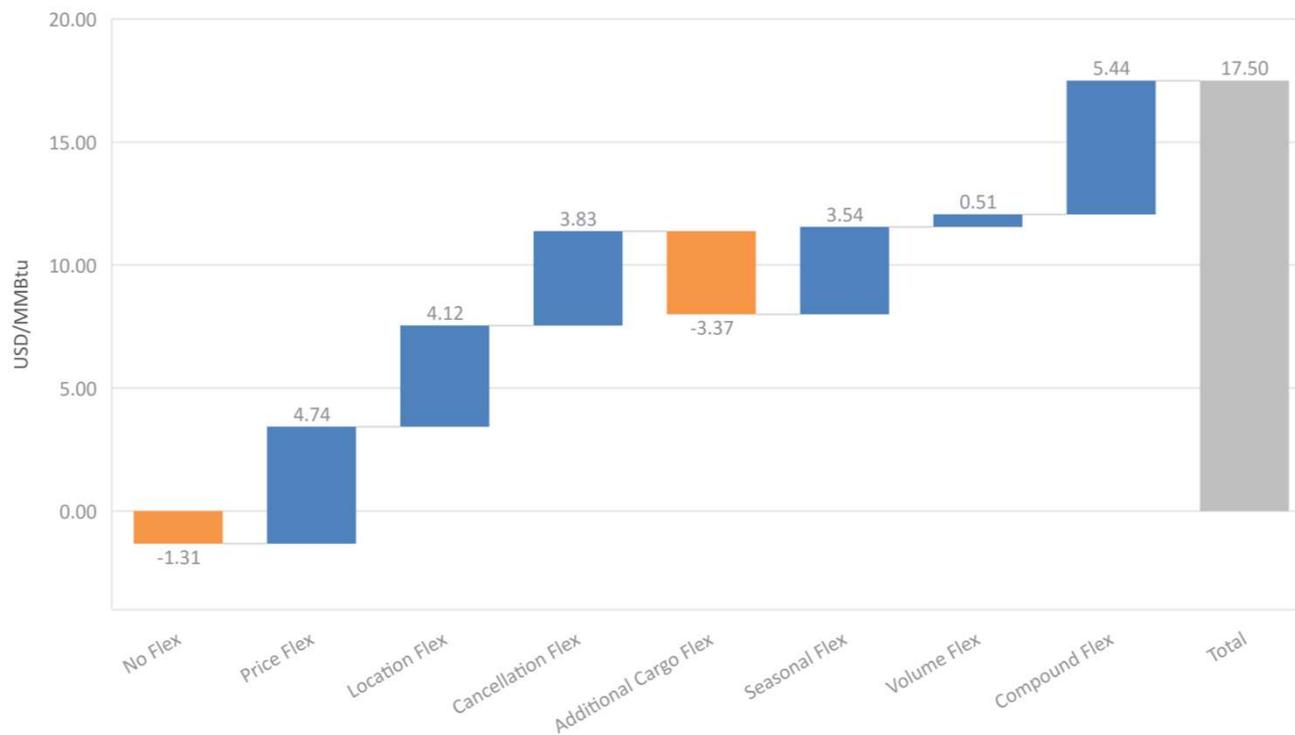
- ▶ **Valuation:** value all major types of LNG structures
- ▶ **Flex value:** value each flex term and additional value from combining flex terms
- ▶ **Scenario analysis:** examine the effect of changing part of the deal, or a particular scenario
- ▶ **Price analysis:** examine the effect on deal value of changing market prices
- ▶ **Probability:** calculate probability of events such as cancellation, delivery to Asia vs Europe
- ▶ **Greeks:** calculate sensitivity of deal value to changes in price, volatility and delta hedge deal value
- ▶ **Buy side/sell side:** evaluate a deal as buyer and a seller and evaluate the value of being long and short each component of flex



Deal analysis - example

Flex decomposition

- ▶ Breakout value of:
 - ▶ No flex
 - ▶ Individual flex terms
 - ▶ Combining flex terms
 - ▶ Long flex and short flex





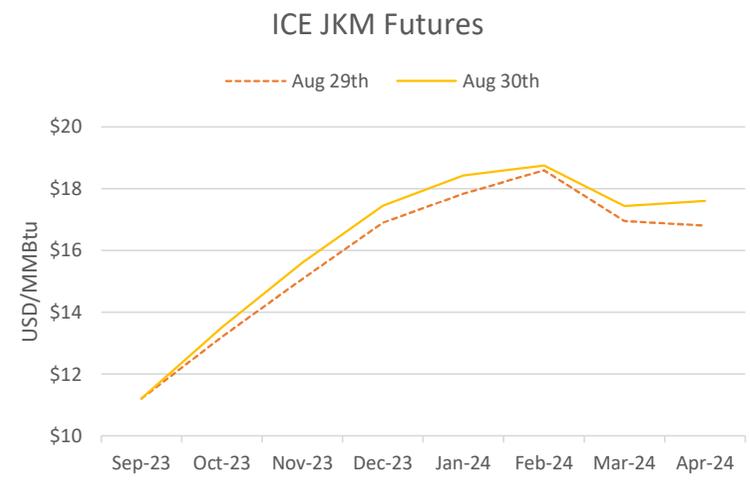
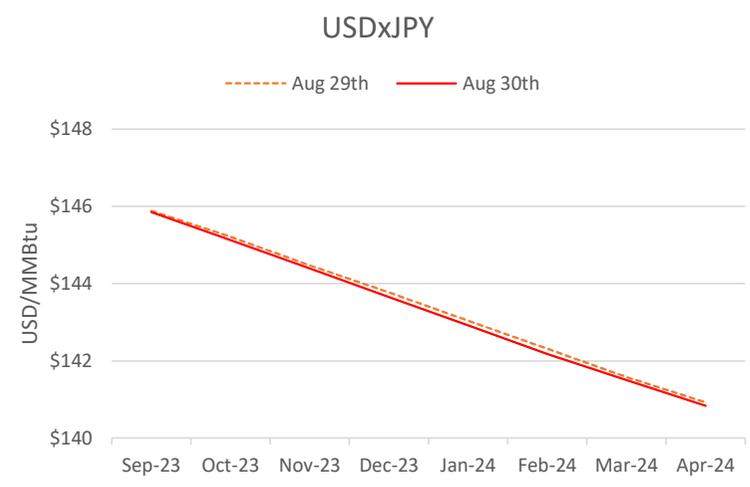
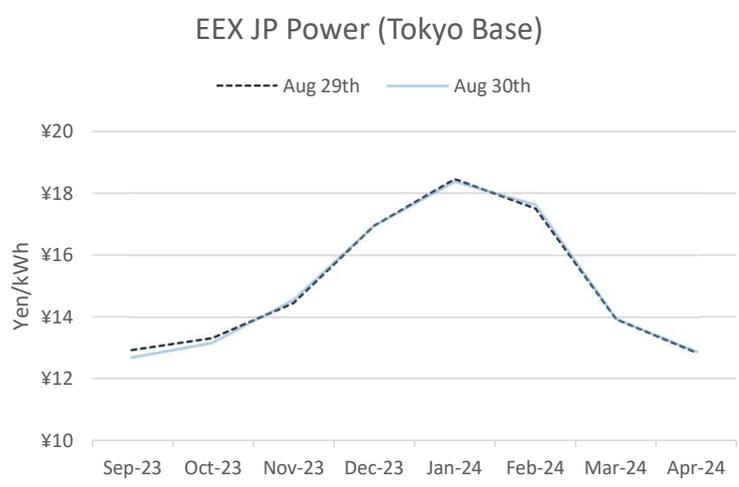
P&L attribution

- ▶ Profit attribution analysis is a process businesses use to evaluate the profitability of different units or segments within their organisation
 - ▶ In essence, profit attribution analysis helps companies answer the question: “Where is our profit coming from?”
 - ▶ By breaking down profits by product line, geographic region, customer segment, or other criteria, businesses can better understand their revenue and profit sources and make data-driven decisions about optimizing their operations.



P&L attribution

Price Change





P&L attribution

MtM

Month	Power [¥ Million]	LNG [¥ Million]	FX [¥ Million]
Sep-23			
Oct-23	5,336		
Nov-23		-6,571	-6,571
Dec-23			
Jan-24		7,775	7,775
Feb-24			
Mar-24	-5,576		
Apr-24			

Aug 30th 2023: **2.168b ¥**

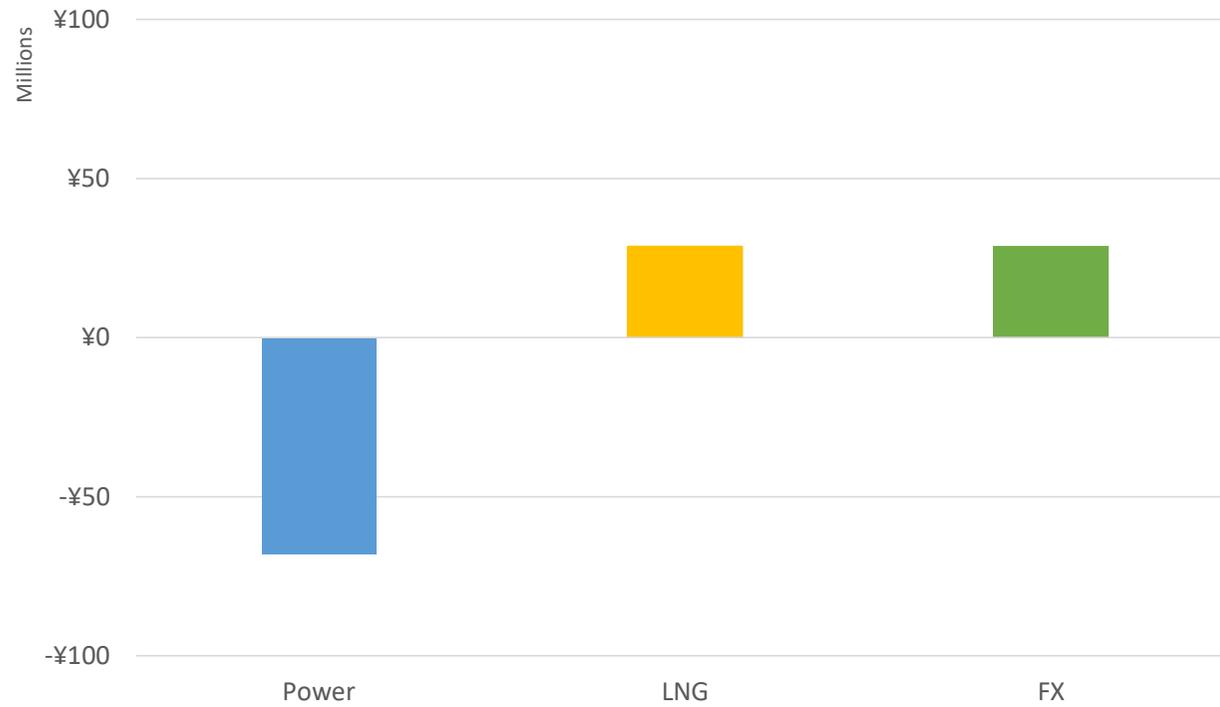
Month	Power [¥ Million]	LNG [¥ Million]	FX [¥ Million]
Sep-23			
Oct-23	5,272		
Nov-23		-6,814	-6,814
Dec-23			
Jan-24		8,047	8,047
Feb-24			
Mar-24	-5,580		
Apr-24			

Aug 31st 2023: **2.157b ¥**



P&L attribution

PnL (1-day)





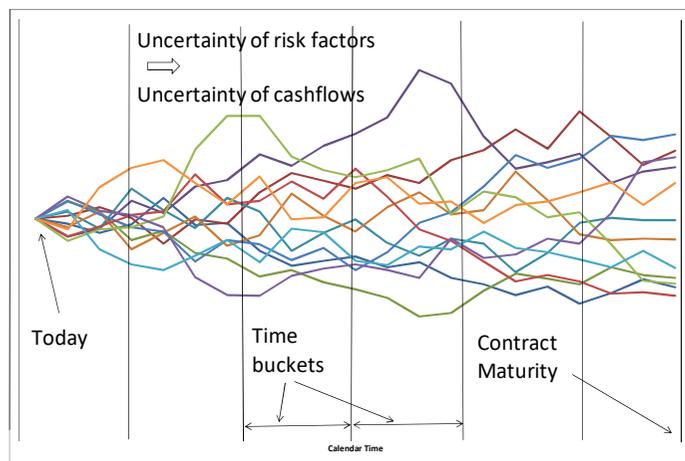
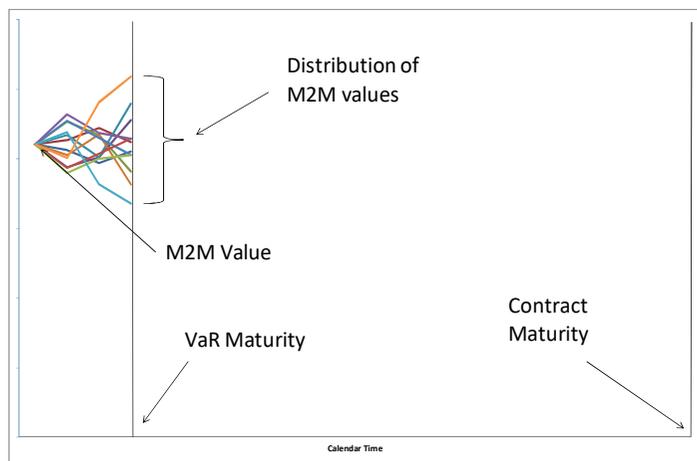
Market and credit risk metrics

- ▶ Enterprise-wide risk management can be defined as “a systematic and disciplined process of identification, measurement, reporting and mitigating risks across all business units and company operations using a unified and conceptually coherent framework”
- ▶ Market risk metrics
 - ▶ Market risk is universally defined as the potential risk of a loss in value or earnings as a result of changes in market factors underlying the portfolio or economic activity
 - ▶ Power, gas, retail, wind, solar, spreads,...
- ▶ Credit risk metrics
 - ▶ Counterparty credit exposure is the probability of loss of revenue through the default, or downgrade, by a counterparty.
- ▶ Risk *measurement* is not risk *management*...!!



Market risk metrics – VaR vs EaR

- ▶ The risk metric that is probably most implemented is Value at Risk (VaR)
 - ▶ The core concept of VaR is that it is a measure of how much the MtM value of open positions might decrease before the market positions could be closed
- ▶ Other relevant metrics are cashflow based (e.g. Earnings at Risk (EaR), GMaR, etc.)
 - ▶ Designed to measure the probability distribution of a company’s potential future cash flows over a chosen future time period



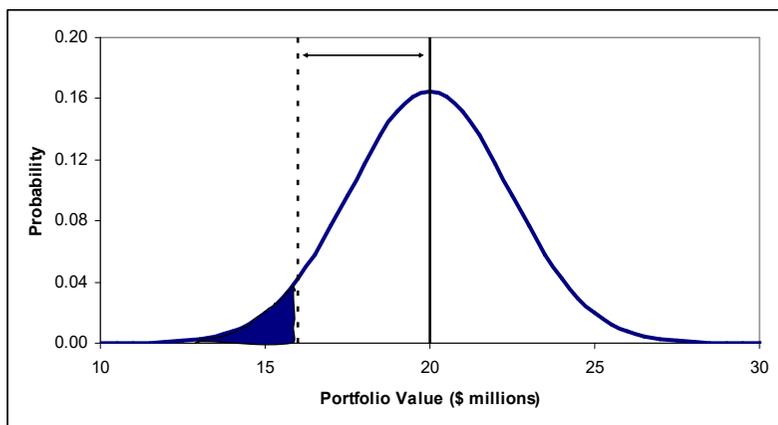
Relevant considerations

- ▶ Traded vs non-traded assets
- ▶ Holding period
- ▶ Sources of risk
- ▶ How and why does the company hedge?

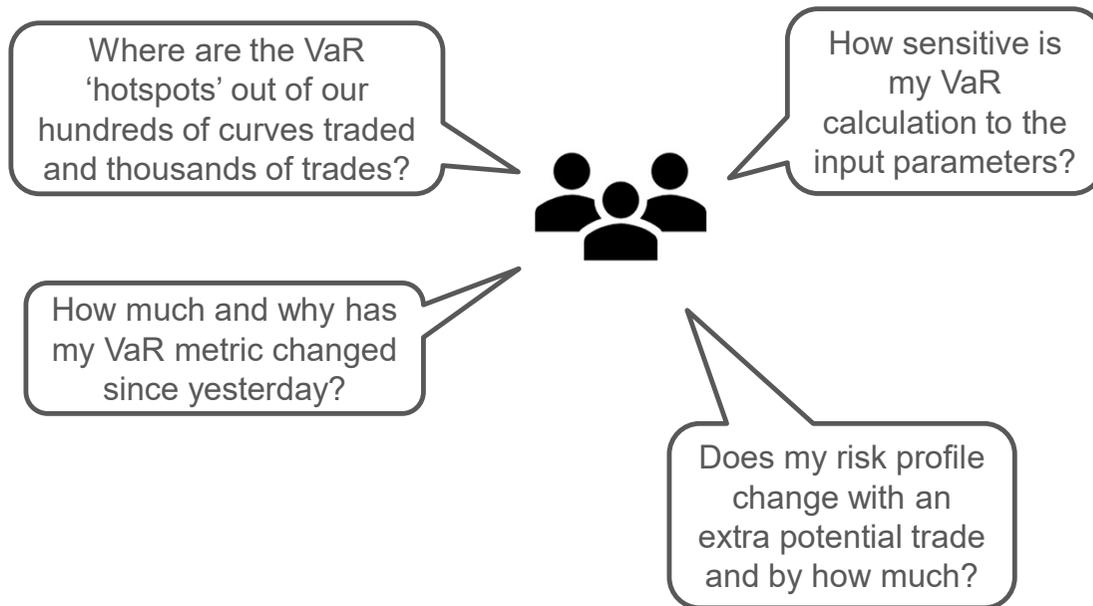


Market risk metrics – e.g. Value-at-Risk (VaR)

- ▶ There are 3 main methods for calculation of VaR
 - ▶ Variance-Covariance or Delta VaR (Analytic VaR)
 - ▶ Historical simulation
 - ▶ Monte Carlo simulation VaR



- ▶ What constitutes ‘best in class’ analysis?

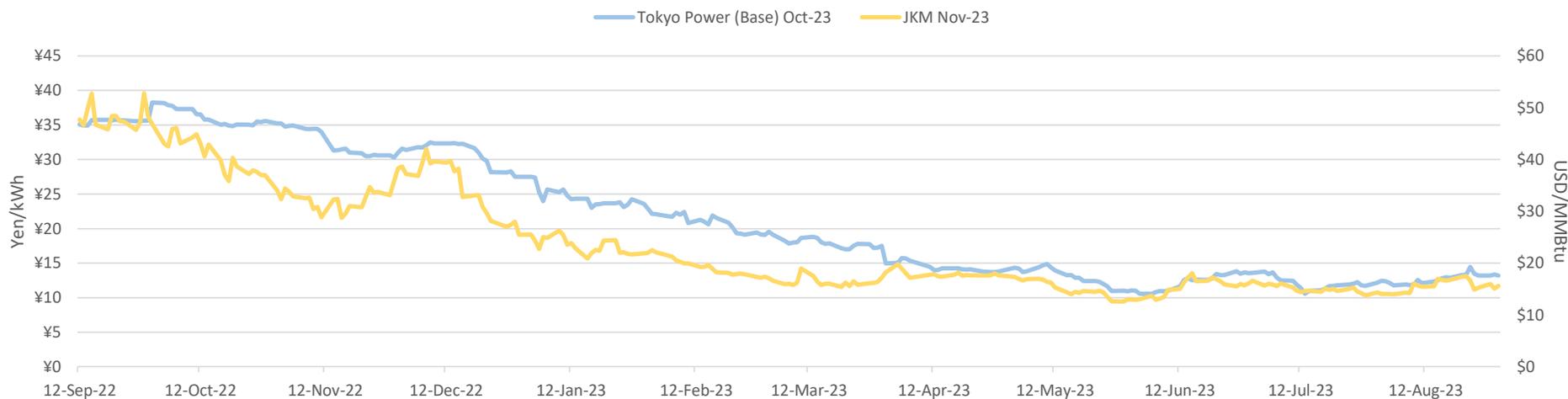




VaR Inputs

- ▶ Historical & current quote data is used to calibrate the VaR Model
- ▶ This data is required to calibrate volatilities and correlations across all required markets in the portfolio

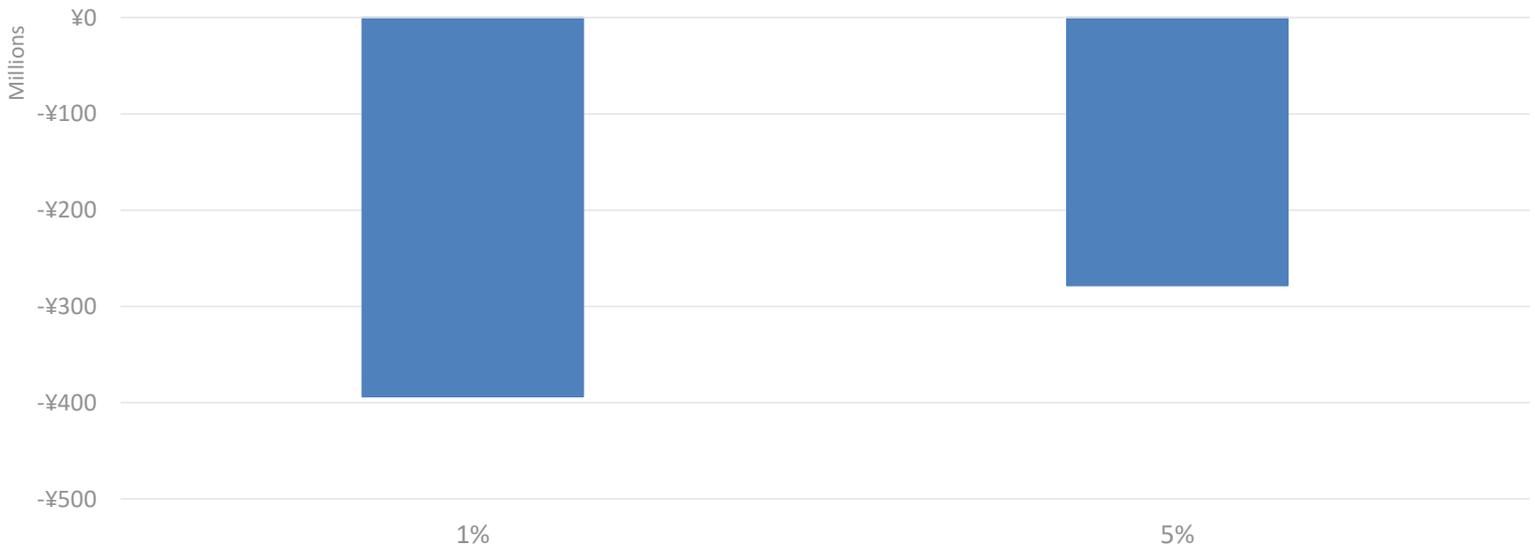
		Tokyo Power (Base)					
		Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
JKM	Oct-23	-0.0286	0.0438	0.0022	-0.0341	-0.0551	-0.0305
	Nov-23	0.0197	0.0946	0.0536	0.0228	-0.0108	0.0152
	Dec-23	0.0211	0.1058	0.0564	0.0384	0.0064	0.0302
	Jan-24	-0.0035	0.0745	0.0334	0.0047	-0.0276	-0.0112
	Feb-24	0.0037	0.0763	0.0381	0.0021	-0.0270	-0.0118
	Mar-24	-0.0138	0.0547	0.0084	-0.0196	-0.0447	-0.0265





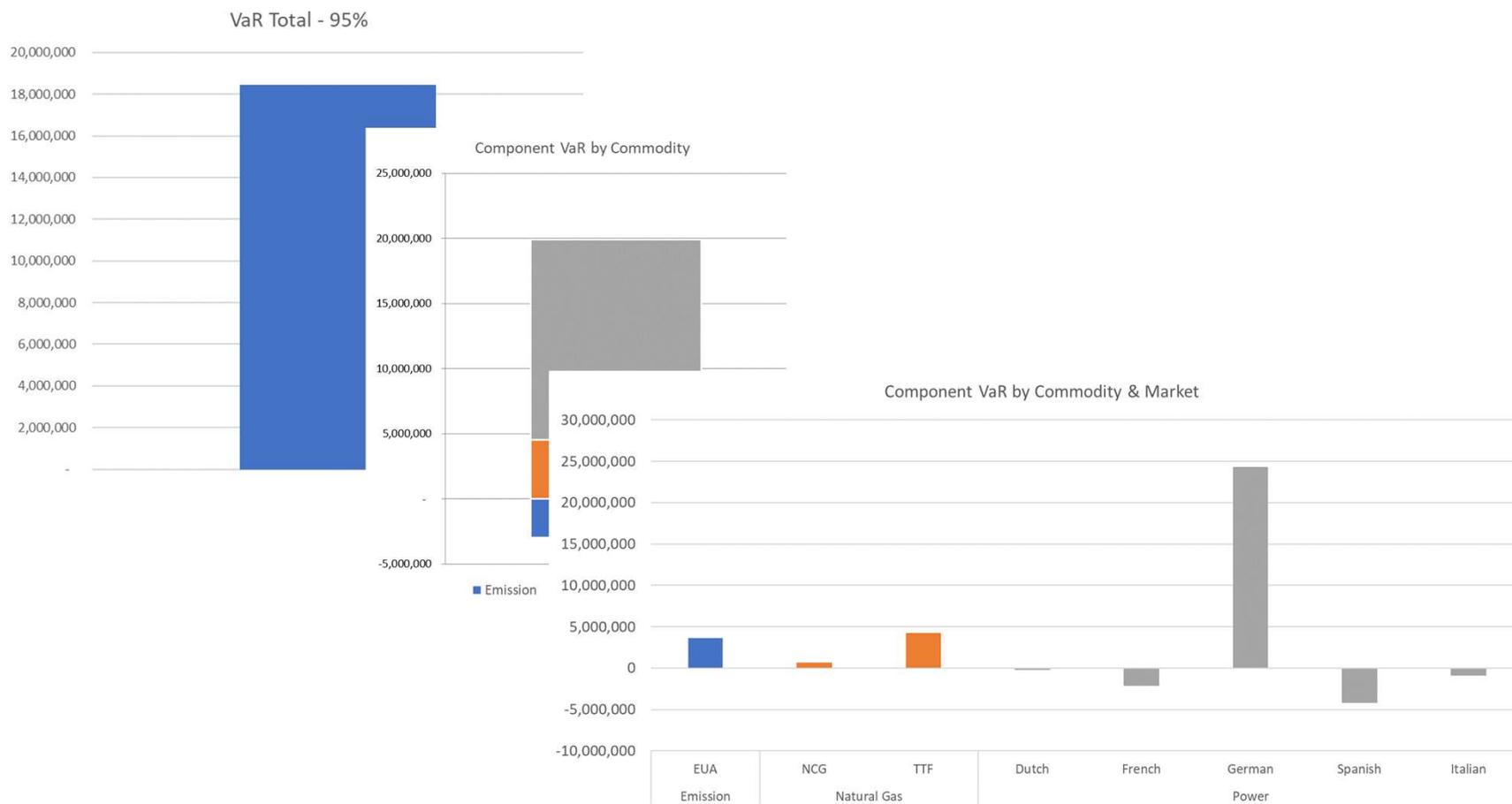
VaR Outputs

	1%	5%
Total	-393,575,620	-278,279,226





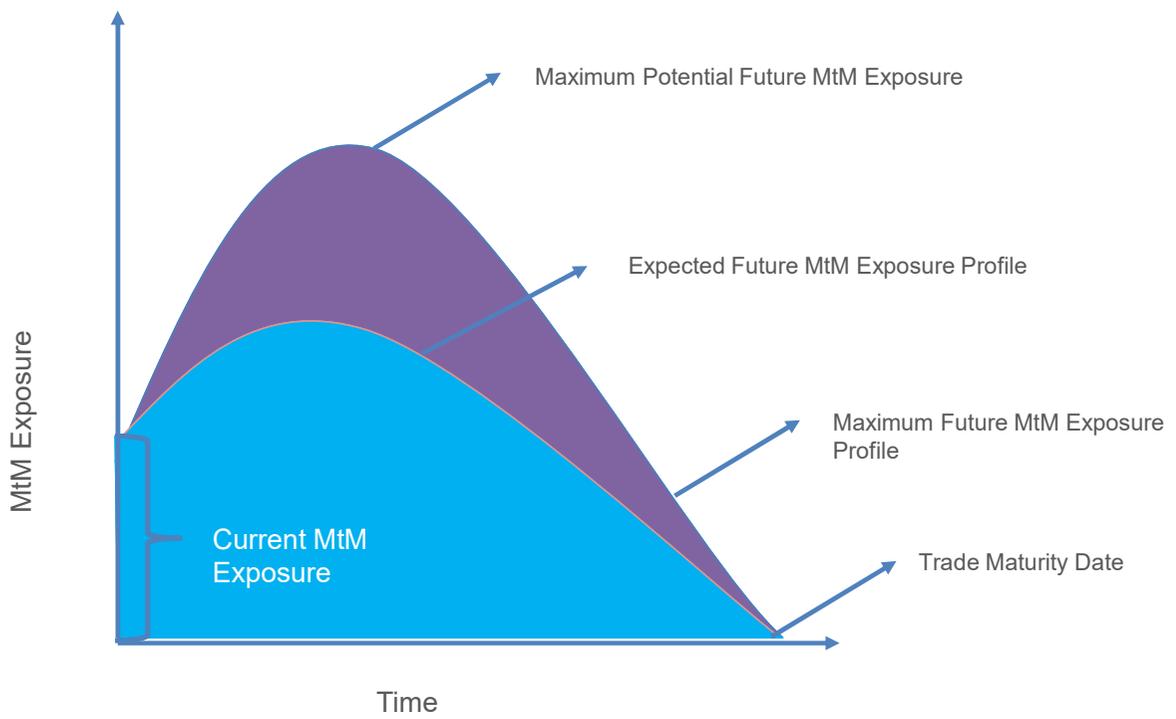
Market risk – drill down analysis





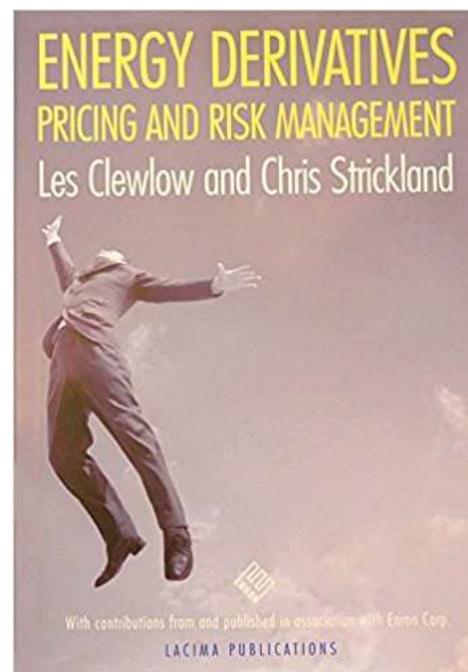
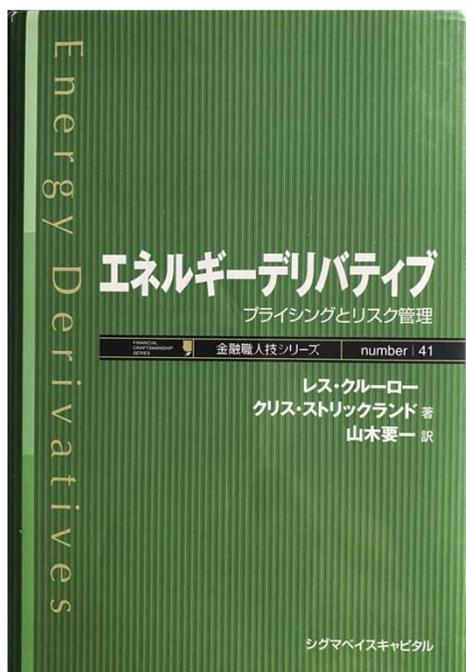
Credit Risk - simulated exposures, potential future exposure(PFE)

- ▶ Current exposure – sufficient statistic if we are only interested in knowing the magnitude of the credit exposure if a given counterparty were to default today
- ▶ If we are interested in knowing “what would be the future exposure in 3 months, or 3 years?” then we need to look at potential future exposures (PFE)





Background reading on Energy Risk Management...



► Whitepapers & articles: <https://www.lacimagroup.com/white-papers-articles/>

Thank you for your attendance!

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