OLIVER WYMAN

ERCOT
THE TEXAS CONNECTION

Corporate Risk

November 9, 2007

Finance & Audit Committee
Project update

Austin, Texas

Confidentiality

Our clients' industries are extremely competitive. The confidentiality of companies' plans and data is obviously critical. Oliver Wyman will protect the confidentiality of all such client information.

Similarly, management consulting is a competitive business. We view our approaches and insights as proprietary and therefore look to our clients to protect Oliver Wyman interests in our presentations, methodologies and analytical techniques. Under no circumstances should this material be shared with any third party without the written consent of Oliver Wyman.

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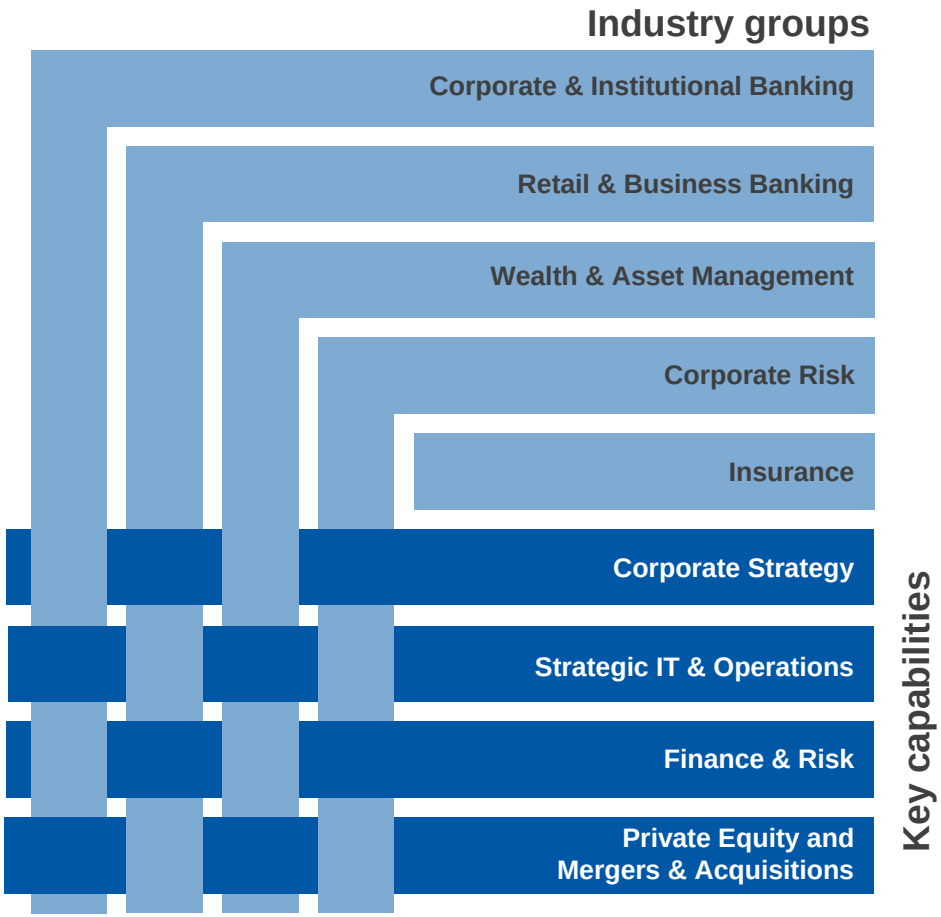
Section number 1

Who is Oliver Wyman

Oliver Wyman brings deep industry expertise and broad functional knowledge to financial services and corporate clients



- Clients include 75 of the global top 100 financial institutions
- More than 1,000 professionals exclusively dedicated to the financial services industry
- We have an unparalleled understanding of the market structure, economics, and possible future development of the segments of the financial services industry
- Our distinct approach is characterized by deep specialization and rigorous fact-based analysis

Corporate Risk

Our capabilities	■ Integrating customimzed Enterprise Risk Management frameworks ■ Designing risk governance structures and processes and associated reporting requirements ■ Articulating risk appetite and tolerances supported with meaningful risk measures and predictive key risk indicators ■ Developing a risk-adjusted approach to evaluating tactical and strategic decisions and optimal corporate portfolios ■ Creating practical and sophisticated modeling tools to analyze tactical downside losses and risks that present both up and downside potentials such as market prices and customer penetration ■ Developing and implementing effective commodity hedging strategies to manage earnings volatility
Our strengths	■ Dedicated experienced senior team exclusively focused on corporate risk and enterprise risk management issues ■ Tailored approaches to key client segments ■ Focus on practical, implementable strategies and solutions that are economically successful ■ Dedicated to increasing the ongoing risk management capabilities of our clients ■ Not a “one-size fits all” methodology but customized by creating the best results by working closely with clients in teams

Oliver Wyman's recent relevant work experience

Oliver Wyman has project experience related to both internal credit scoring for financial institutions and risk management issues within the energy industry

Internal credit scoring

- Developed PD and LGD models for a major US regional bank in all commercial and retail segments (e.g., large corporate, CRE, leasing, energy, healthcare, mortgage banking)
- Advised a top-5 non-bank financial services provider in the design of a rating framework (e.g., masterscale and treatment of guarantees)
- Revised a bank's existing credit rating framework to be better aligned to specifications of Basel 2 accord
- Constructed PFE and capital models, driven by internal scoring models, for over one hundred of our past clients

Energy industry

- Defined the broad risk governance structure over all oil, gas, power and emissions trading activities for a major oil company
- Built a capital at risk model for a utility to aid capital expenditure and M&A planning
- Reviewed major market and credit risks associated with the trading function for a mid-sized utility, and calculated capital requirements consistent with the revised Basel 2 Capital Accord
- Defined a comprehensive ERM approach for an integrated energy firm, and linked this to the strategy review process
- Benchmarked the risk management capabilities of an energy utility focusing on the power generation portfolio

Section number 2

ERCOT credit evaluation project

The credit evaluation project covered three workblocks

Workblock 1

Credit practices review

- Assess ERCOT's current credit management practices
- Assess ERCOT's current creditworthiness practices
- Examine nodal impacts

Workblock 2

Credit scoring model development

- Develop a set of credit rating tools to assess probabilities of default (PD) and loss given default (LGD) for each participant
- Identify model factors based on financial data and qualitative assessments
- Test against available benchmarks

Workblock 3

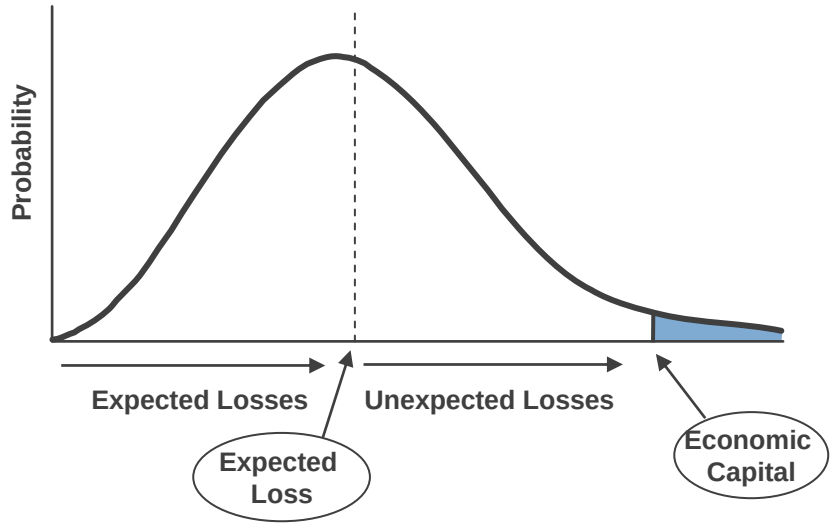
Credit loss model construction

- Include collateral limits, price caps, other key assumptions as inputs
- Look at possible volumetric exposures for each participant
- Simulate market prices, which with the volumes yield exposure at default (EAD)
- Simulate losses from credit failures
- Explore the impact of exogenous variables/ stress events

Credit loss and capital adequacy definitions

- **Capital adequacy (economic capital):** Based on the **portfolio analysis** and an assessment of the market, it is the amount of losses you will lose over a specified time period with probability X%
- **Expected Loss:** Long run statistical average of credit losses across a range of typical economic conditions
- **Portfolio analysis:** Aggregation of losses by counterparty across the market

Illustrative Loss Distribution



Terms used when measuring credit loss:

- **Probability of default**: The probability that a counterparty will default at some point in a specified time horizon
  - **Default correlation:** Similarity of the counterparty to other counterparties in the portfolio in terms of common drivers of default (e.g. geography, industry, business model)
- **Exposure at Default:** Sum of the exposures at time of default for each counterparty over the specified time horizon
- **Loss given default:** Sum of exposures **in excess of collateral and other risk mitigation** at time of default for each counterparty over the specified time horizon

Workblock 2 – Internal credit scoring methodology

The primary purpose of workblock 2 is to develop enhanced credit risk assessment tools and to provide initial loss parameter estimates for input into the capital model

Identify risk factors

- Review best practice
- Determine quantitative factors
- Determine qualitative factors
- Determine segmentation

Parameterize scoring model

- Construct factor definitions
- Determine factor scores
- Determine factor weights
- Map scores to PDs and PDs to ratings

Identify adjustments

- Determine warning signals
- Assess parental support framework
- Assess potential overrides

Verify and test assumptions

- Vet approach with ERCOT and market participants
- Utilize available data to compare model results against benchmarks

Deliverables

- Credit scoring framework
- Near-term PD and LGD approximations
- Associated methodological and user documentation
- Recommendations for future enhancement

Workblock 3 – Potential future exposure (PFE) and economic capital modeling

The capital adequacy model will estimate the severity of tail-event credit losses in ERCOT's market

Market simulation

- Define the relevant markets and modeling parameters
- Incorporate flexible time steps

Simulation of participant positions

- Sample historical data for existing markets
- Provide estimates and bounds for new markets

Participant solvency

- Assess change in exposure compared to credit strength
- Identify default impact from shortfalls, given required collateral and other risk mitigation measures

Deliverables

- Loss distribution model yielding capital requirements
- Associated methodological and user documentation

Section Number 3

Credit Process Evaluation

ERCOT's credit worthiness and management practices have been generally effective in mitigating losses, but fall short of "best practices" in some areas

Category	Priority level	Progress toward best practice	Current practice	Assessment	Potential next steps
Risk appetite	High		▪ Some internal discussion in market meetings	▪ Risk appetite definition should be explicitly defined to better guide ERCOT's risk policies	▪ Estimate credit risk using credit loss model (current OW effort) ▪ Assess market's comfort level with loss estimates and ability to absorb losses ▪ Board should develop a formal risk appetite statement ▪ Ensure credit policies and procedures are consistent with risk appetite and tolerance
Credit scoring	Medium		▪ Agency ratings used where available, but primarily for limit setting purposes ▪ Creditworthiness assessed using risk factors common to credit scoring models	▪ Internal credit scoring model will augment agency ratings ▪ Requires additional data, maintenance and refinement	▪ Develop internal credit scoring model (current OW effort) ▪ Vet methodology and results with CWG and other governance committees (underway) ▪ Refine credit scoring model as additional data becomes available

ERCOT's credit worthiness and management practices have been generally effective in mitigating losses, but fall short of "best practices" in some areas

Category	Priority level	Progress toward best practice	Current practice	Assessment	Potential next steps
Exposure measurement and monitoring	High		▪ Estimated Aggregate Liability (EAL) and Net Resource Load Imbalance (NLRI) track very recent historical exposure activity ▪ Measurement of forward exposure is based on recent history ▪ Processes are being automated ▪ Response to alerts is rapid and well-defined	▪ EAL and NLRI allow for rapid response to exposure increases ▪ Some discretionary adjustments to exposure in the past have run counter to ERCOT's prudent limits (although ERCOT can adjust exposure up or down) ▪ Forward exposure measurement approach lacks sophistication compared to techniques employing forward price and volume estimates	▪ Forward exposure measurement should be based on forward risk factors (e.g. forward price and volume estimates) ▪ Credit loss model (OW effort) capabilities may be leveraged to simulate potential future exposure ▪ Interim solution may be to calculate NLRI daily
Loss reserve and capital	High		▪ Some single scenario estimates have been made ▪ Based on historical market circumstances	▪ Scenarios do not provide a measure of likelihood for the derived loss amount, or the ability to derive multiple loss estimates at different points along the probability spectrum ▪ Credit loss model will provide best practice capability	▪ Credit loss model (OW effort) will estimate loss magnitude ▪ Use economic capital results to foster discussion regarding risk appetite and a more consistent framework for considering loss reserves

ERCOT's credit worthiness and management practices have been generally effective in mitigating losses, but fall short of "best practices" in some areas

Category	Priority level	Progress toward best practice	Current practice	Assessment	Potential next steps
Loss reserve and capital	High		▪ Some single scenario estimates have been made ▪ Based on historical market circumstances	▪ Scenarios do not provide a measure of likelihood for the derived loss amount, or the ability to derive multiple loss estimates at different points along the probability spectrum ▪ Credit loss model will provide best practice capability	▪ Credit loss model (OW effort) will estimate loss magnitude ▪ Use economic capital results to foster discussion regarding risk appetite and a more consistent framework for considering loss reserves
Credit worthiness monitoring and reporting	Medium		▪ Participant exposure is monitored daily ▪ Creditworthiness is updated as new information is received ▪ Press releases and industry news is monitored	▪ Daily exposure monitoring of each QSE is a best practice ▪ Creditworthiness updates could be more rigorously scheduled and verified ▪ Real time indications such as changing credit spreads would enhance monitoring	▪ Improve enforcement of collecting financials from all QSEs (underway) ▪ Credit scoring model (OW effort) may help incentivize ERCOT to collect financials
Workout	Low		▪ Numerous remedies are available for QSEs in breach ▪ Remedies range from retaining funds to revocation of QSE rights	▪ Range of remedies allows appropriate response in a variety of situations, and is a best practice	▪ Continue to investigate workout solutions through other venues (e.g., Legal department, remedies, etc.)

ERCOT's credit worthiness and management practices have been generally effective in mitigating losses, but fall short of "best practices" in some areas

Category	Priority level	Progress toward best practice	Current practice	Assessment	Potential next steps
Limit setting	Low		▪ Unsecured credit granted to rated entities based on rating vs. Tangible Net Worth (TNW) ▪ Acceptability thresholds apply to non-rated entities but few qualify	▪ Most consistent limits across risk ratings as compared to peers ▪ Levels are more conservative than peers for investment grade entities ▪ Setting levels based on risk appetite definition is best practice	▪ Increase limits for most creditworthy QSEs (A-rated entities) ▪ Use credit scoring model (OW effort) to inform or directly determine limits
Collateral requirements and management	High		▪ Full collateral is required based on exposure (includes pre-invoiced activity and future estimates of activity) ▪ Clear definitions of acceptable collateral types	▪ Requirements are stringent and similar to other ISOs ▪ Applying valuation haircuts to guarantees is best practice ▪ Use of standard forms for guarantees and LCs is a best practice	▪ Evaluate utility of using collateral haircuts for guarantees (in the credit loss model and/or collateral policies)

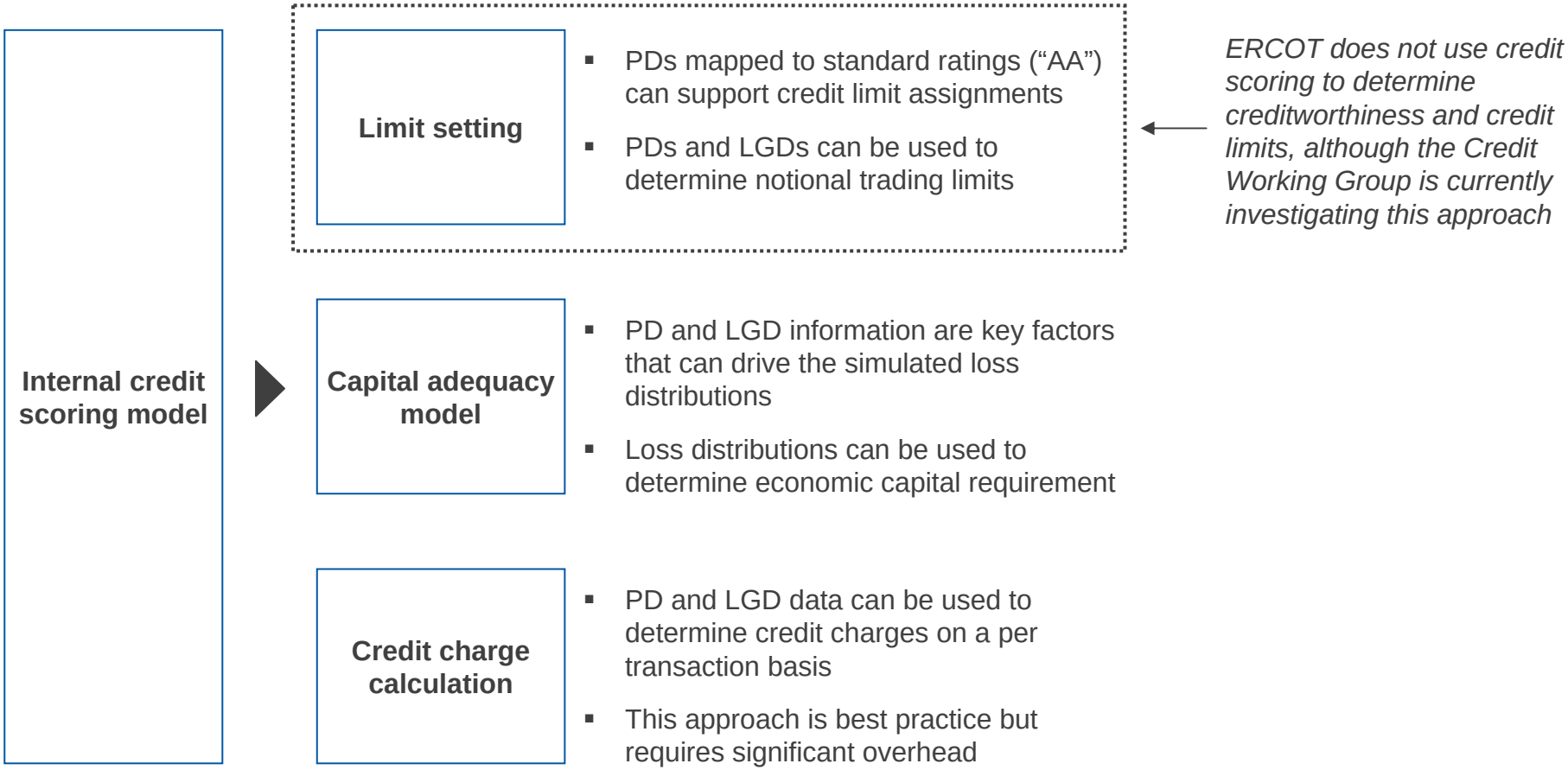
ERCOT's credit worthiness and management practices have been generally effective in mitigating losses, but fall short of "best practices" in some areas

Category	Priority level	Progress toward best practice	Current practice	Assessment	Potential next steps
Organization and governance	Medium		▪ Credit activities report through the Treasurer ▪ Three professionals dedicated to credit analysis and management ▪ CWG ensures that appropriate procedures are implemented to mitigate credit risk in the ERCOT market	▪ Level and scope of responsibilities are appropriate and best practice ▪ Lean staffing will require augmentation to handle future requirements ▪ CWG reporting structure and role provide valuable perspective to ERCOT	▪ Prioritize level and scope of future credit department responsibilities ▪ Determine number of new staff required (1-2 FTEs may be appropriate)
Technology	Low		▪ CMM in the configuration and implementation phase	▪ Credit loss model will enhance sensitivity analysis of considered changes ▪ CMM platform for credit scoring model and other data management is best practice	▪ Ensure interim solutions are robust and audited frequently ▪ Use credit loss model (OW effort) to test potential policy changes and risk mitigation techniques ▪ Begin planning for eventual integration

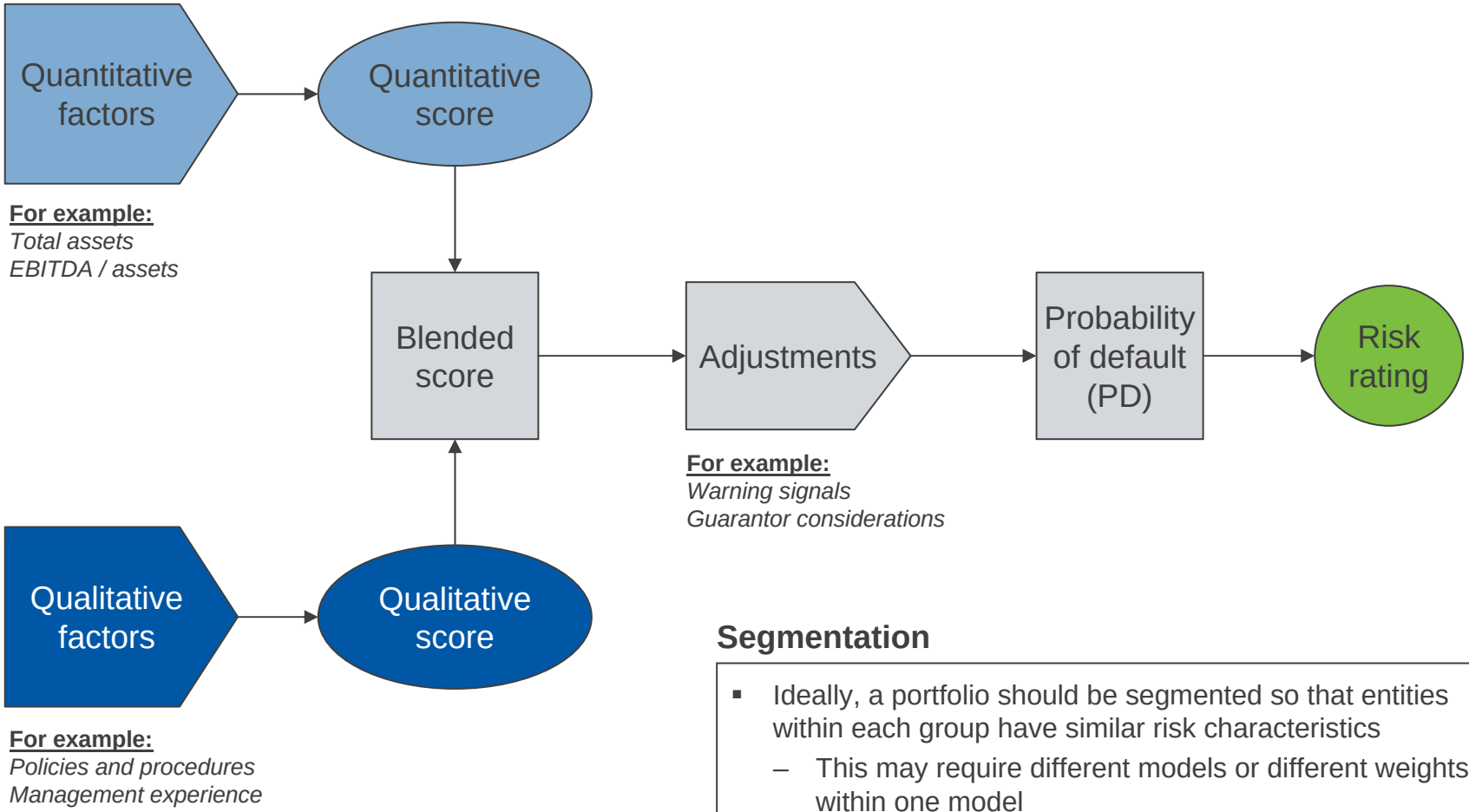
Section number 4

Internal credit scoring

An effective internal credit scoring model can be used to drive other important credit risk-related functions



A standard credit scoring approach (PD) uses a blended quantitative and qualitative score and potential adjustments to arrive at a risk rating



Segmentation

- Ideally, a portfolio should be segmented so that entities within each group have similar risk characteristics
  - This may require different models or different weights within one model
- Segmentation of a portfolio can be performed along different dimensions (e.g., size, sector)

Our approach at ERCOT covered the best practice steps, but with some necessary adjustments due to data constraints

Statistical approach (assuming large sample size)

Data collection	Factor generation	Single factor analysis	Multifactor analysis	Calibration and testing
▪ Accumulate sufficient default data (i.e., 200+ defaults) ▪ Distribute a tailored questionnaire to credit officers to collect additional data	▪ Solicit feedback from industry experts ▪ Benchmark against similar models	▪ Measure the predictive power of each factor against historical defaults ▪ Determine scoring within each factor by measuring default frequency against factor score	▪ Run statistical regression analysis to determine most predictive factors and weights	▪ Calibrate model to historical long-run default frequency ▪ Test model using 'out sample data' ▪ Field test the model against expert opinion

Approach utilized for ERCOT

Data collection	Factor generation	Single factor analysis	Multifactor analysis	Calibration and testing
▪ Collect information on QSEs who have provided data ▪ Collect information on historical defaults and industry data where possible	▪ Same as above	▪ Use benchmarking and expert judgment to determine factor short list and scoring	▪ Determine model factors and weights using benchmarking and expert judgment	▪ Test the model against vended solutions (e.g., RiskCalc) ▪ Vet model logic with ERCOT and market participants

ERCOT's credit scoring framework must allow for PD estimation with current obligor data

	Practical PD approximation	'Best-fit' scoring framework
Timeframe	▪ Near-term	▪ Long-term
Description	▪ Best approximation of QSE PDs given data constraints	▪ Future-state credit scoring mechanism given full set of financials and qualitative factors
Purpose	▪ To use results as an input into the capital adequacy model	▪ To use results as an input into the capital adequacy model ▪ To upgrade existing credit practices
Segmentation	▪ Non-rated entities with financials ▪ Non-rated entities without financials ▪ Rated entities	▪ Non-rated entities[1] ▪ Rated entities

- Segmentation rationale for near-term estimation of PDs was based on data availability
- A unique rating treatment will apply to non-rated entities who are subsidiaries of rated parent entities

1 In the future-state credit scoring framework, we recommend that all non-rated entities provide entity-level financials. If an entity does not provide financials, it will receive a conservative score.

Probabilities of Default are estimated differently depending on the type of QSE

Segment	ERCOT approach
Non-rated with financials	▪ Internal scoring model is used to rate this segment ▪ Quantitative score calculated from provided financials ▪ Qualitative score is initially neutral, but ERCOT can adjust for highly positive or negative answers to qualitative questions
Non-rated without financials	▪ All QSEs in this segment receive a CCC+ rating[1] ▪ Rating is mapped to a PD, using broad industry data
Publicly rated	▪ Public rating is mapped to a PD
Special case for un-rated subsidiary with rated parent	▪ All QSEs in this segment receive a standalone CCC+ rating (if financials are not provided) ▪ Parent entities receive their public rating ▪ Group logic is applied to determine strength of relationship between subsidiary and parent

1 per CWG feedback on ERCOT's proposal to use B

Best practice approaches for segmentation and default definition have been modified for ERCOT due to data constraints

Segmentation

- Best practice approaches group entities that share similar risk factors, but data constraints have impacted this approach for ERCOT
  - Little information on business models of QSEs
  - Limited detail of the entities represented by each QSE
  - Relatively small amount of financial data
- The proposed segmentation remains similar to ERCOT's existing approach
  - Non-rated entities (includes non-rated munis/co-ops and non-rated subsidiaries of rated parent entities)
  - Rated entities (these entities will not be rated using the credit scoring model)

Definition of default

- Best practice uses defaults to determine risk parameters and calibration
  - Identification of short factor list and scoring within each factor
  - Identification of most predictive combination of factors
  - Weighting of each factor
  - Calibration of raw scores to PDs
- Our default definition is based on QSEs that did not make payments within 4 business days
  - This definition only includes credit events stemming from a contractual breach of payment obligation by a QSE, and does *not* include any other loss events (e.g., QSEs that elect to drop an LSE but remain active in the market)
- Due to limited default history, we cannot rigorously parameterize the model based on performance data

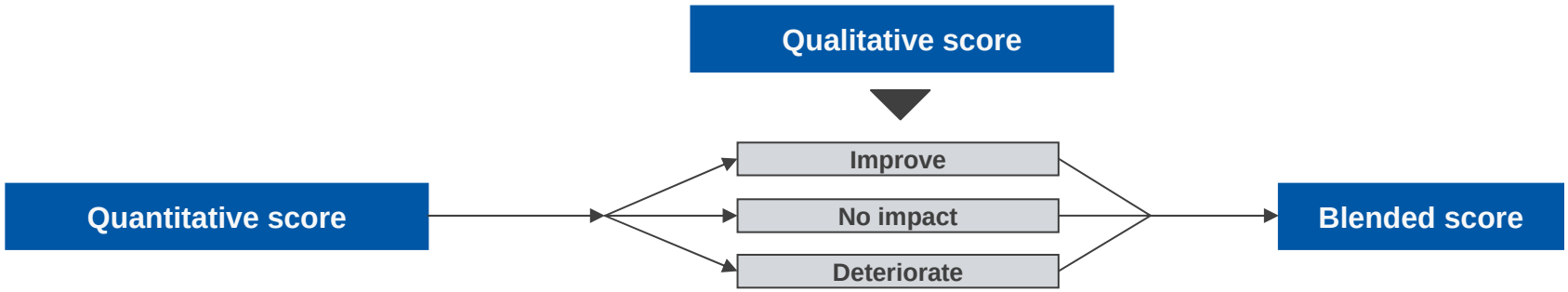
Selected financial and qualitative factors and weights

Quantitative factors	
Proposed factor	**Weight**
Working Capital/Sales	30%
Current Ratio	10%
Equity/Assets	20%
EBITDA/Interest Expense	10%
EBITDA/Sales	10%
Net Income/Assets	10%
Total Assets	10%

Qualitative factors	
Proposed factor	**Weight**
Ability to access funding in difficult market environment	25%
Margin call and late payment history	20%
Experience of company leadership	15%
Recent growth	15%
Risk management policies and practices	10%
Quality and timeliness of reporting of financial information	10%
Length of time as QSE	5%

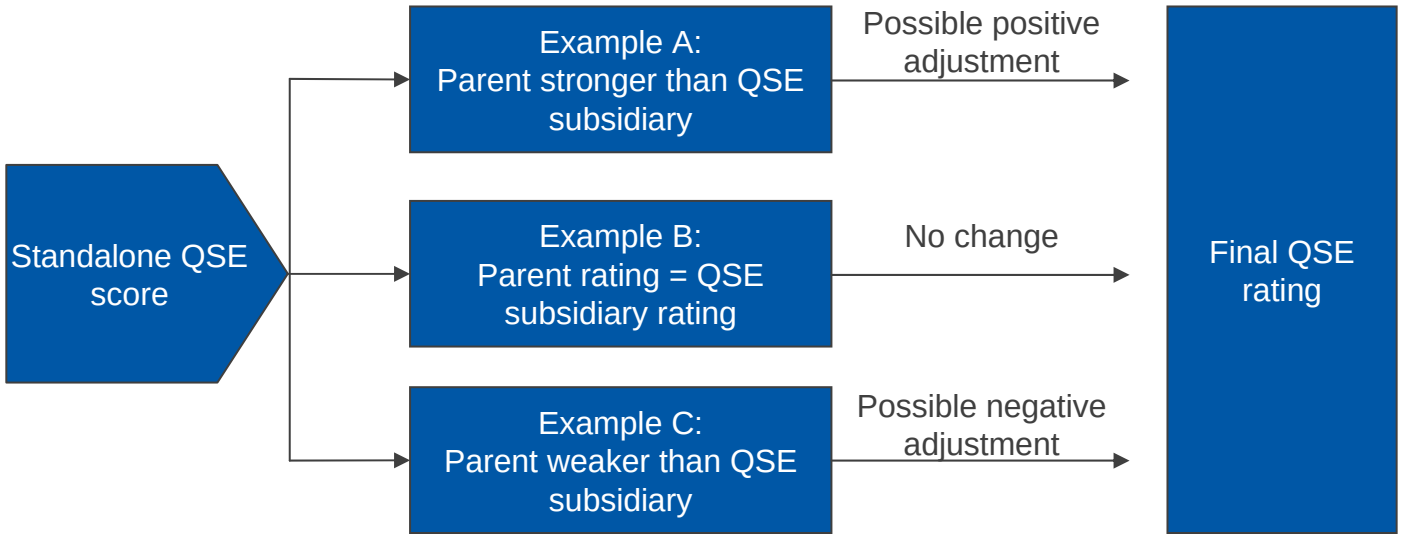
70% weighting

30% weighting

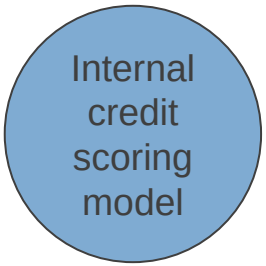


Group logic has been implemented in order to identify the relationship between a QSE subsidiary and its parent

- If a parent and a subsidiary have different independent ratings in some cases it may be appropriate to modify the score of the subsidiary
- The group logic framework is driven by several factors
  - Definition of the parent (i.e., must be the entity that legally and/or economically controls all entities within a group)
  - Type of expressed support (i.e., is the support legally enforceable?)
  - Extent of the relationship (i.e., what is the strategic importance of the subsidiary to its parent?)



The scoring approach groups output into a rating category with an associated midpoint PD so as not to overestimate precision



Resulting PD

- Example -

30bps

Map PD to a rating category

PD range (bps)	Rating	Midpoint PD (bps)
3-5	AAA-A+	4
5-10	A+-A-	8
10-15	BBB+	13
15-25	BBB	20
25-40	BBB-	33
40-80	BB+	60
80-135	BB	108
135-220	BB-	178
220-365	B+	293
365-600	B	483
600-1000	B-	800
> 1000 *	CCC+	1500

Final output based on rating and midpoint PD

BBB 33bps

* All lower PD's map to this rating

Benchmarking provided unbiased comparisons and review by the Credit Working Group provided third-party input and verification

- Send financial data of market participants to outside vendors for scoring*
  - Moody's KMV RiskCalc
  - CreditAnalyzer
  - Small Business Scoring Service (SBSS)
  - Z-score (E. Altman)

- CWG was presented with the overall methodology and suggested parameter sets
  - Made suggestions regarding
    - Composition of certain ratios used as quantitative factors
    - Clarity of several qualitative factors
    - Rating given to QSEs who lack sufficient information for scoring (CCC+)
    - Segmentation of model for public power entities
  - Provided insights from use of credit scoring models at other ISOs
  - Several issues are not entirely resolved
    - Acceptability of group logic to modify ratings given parental relationships
    - Treatment of capped third party guarantees
    - Source of financial data provided to ERCOT

* This benchmarking approach is only valid if the vended tool of interest was *not* used in the development process of the scoring model

Section 5

Credit loss model and Economic capital estimation

Credit loss modeling

The questions this type of model addresses center on the potential for credit-related losses

Expected Loss

What level of credit losses is "normal"?

- Quarterly or annually
- This loss amount will vary, and is considered the **expected loss**
- Business must accommodate these

Economic Capital

What is the greatest loss we can expect?

- Over a given period of time
- For a given level of confidence
- Sets a standard for solvency
- Sometimes used for determining **economic capital**

How can these numbers be reduced?

- Impact of credit and collateral rules
- Through process changes; billing cycle, mass transition handling
- Monitoring effort enhancements

Do market rule changes impact the expected losses?

- Price cap levels
- Netting agreements
- New instruments or derivatives
- Bidding restrictions and rules

Approach

- **Model the inputs of interest in a way that captures the important characteristics and relationships**
- **Simulate the resulting market environment and the occasional default of the participants**
- **Calculate the losses resulting from each simulation, and examine these statistics**

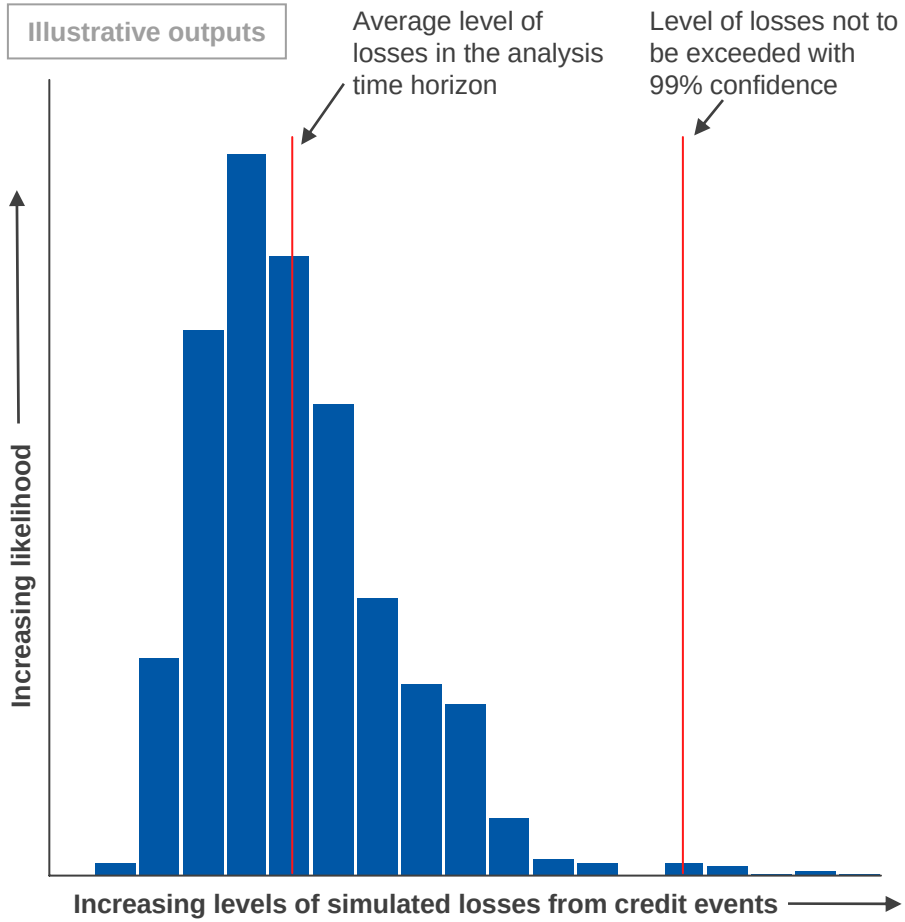
Fundamental credit loss model inputs and outputs

As a tool, the model will illuminate the impact of changes in the inputs on these results

Illustrative inputs

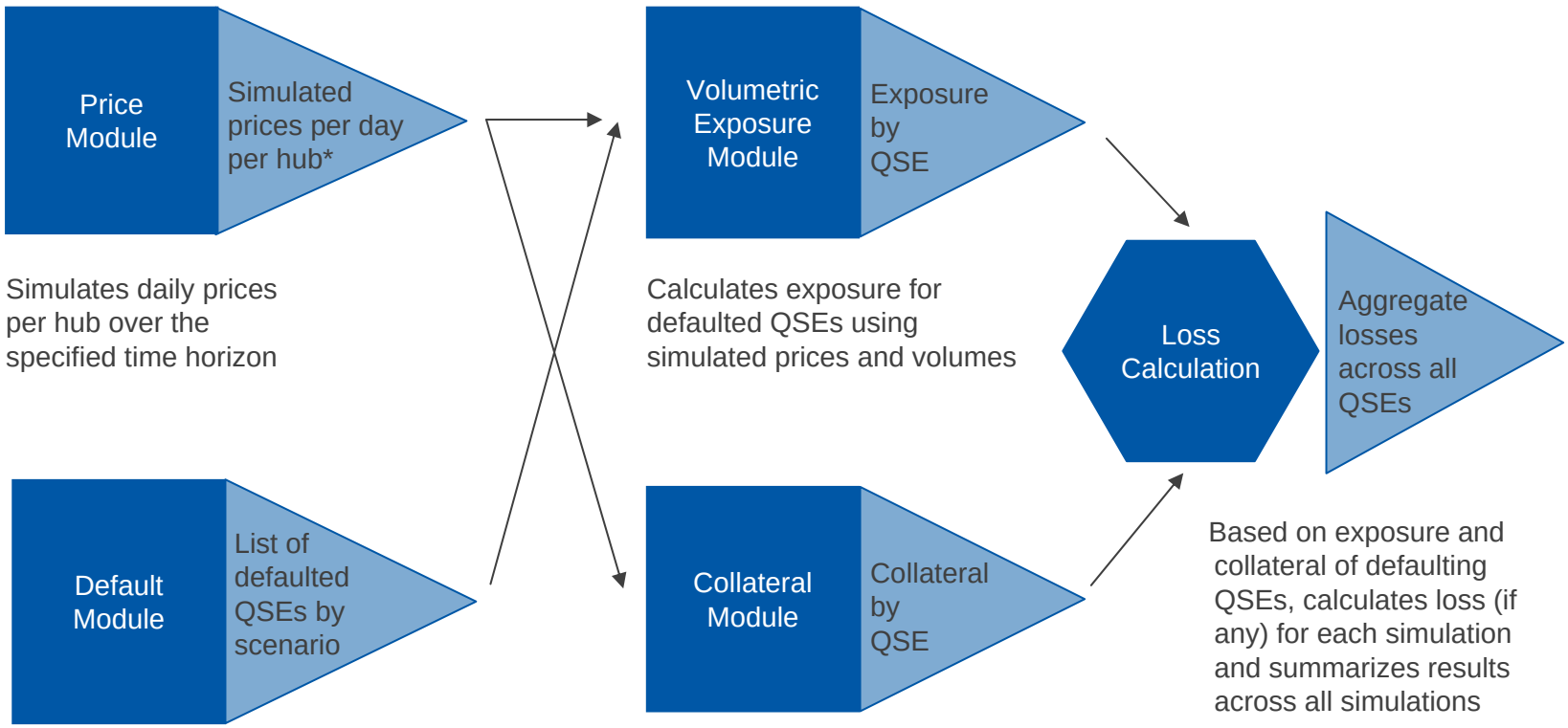
- **Forward prices**
- **Historical volumes**
- **Historical prices**
- **QSE credit ratings (credit scoring model results)**
- **ERCOT collateral rules**
- **ERCOT credit management rules**

Illustrative outputs



Credit Loss Model – High level credit loss calculation configuration

The model consists of four modules: default, price, volumetric exposure and collateral



*Hub refers to a zone, settlement point, location or market

The model will be run thousands of times in order to estimate a credit loss distribution – this schematic represents one simulation

The model allows the user to make adjustments to inputs and measure how those changes impact the prospective distribution of credit losses

Global inputs

- Time horizon (in days)
- Number of simulations
- Number of hubs/zones
- Number of QSEs

Default module inputs

- Credit score of each QSE (i.e., probability of default)
- Default correlation types
- Market event sensitivity types

Price module inputs

- Price movement correlation between zones
- Frequency and size of jumps
- Jump event types (1-, 3-, 6-day jump series)
- Frequency of jumps common to multiple zones
- Differences that drive CRR pricing

Exposure module inputs

- Settlement and billing cycle
- Exposure escalation behavior
- Maximum potential volume
- Length of time of mass transition (if applicable)

Collateral module inputs

- Number of days to post collateral and cure a breach
- Simplified collateral calculations
- Collateral haircuts

Key default modeling assumptions or issues

Likelihood of each default driven by PD

- Agency rating or scoring model rating of each QSE is mapped to a historical one year default probability
- Given the analysis horizon, each QSE has an estimated likelihood of default (bankruptcy or non-payment)

Default correlation

- Correlations are identified by QSE “default correlation” type
- A correlation is assigned across QSEs within a type, and across all pairs of types

Defaults are linked to market price in time

- Default dates are driven by QSE “price sensitivity” type
- These identify sensitivity of default likelihood to high market prices

Key price modeling assumptions or issues

Basic price movements based on history

- Underlying forward prices based on current gas forwards and historical monthly spark spreads in these regions
- Day-to-day price stability (without jumps) has changed little over the past few years
- Seasonality is reproduced, although very small
- Simple daily average currently used in each location, load weighted may be preferred

Jumps based on history and price cap level

- Average jump size based on recent history for each location
  - Incorporates cap and hrs/day
- 99th percentile highest jumps are tied to price cap levels
- Jump frequency is flexible

Synchronized jumps across zones is common

- Historically, many jumps occur on the same days in all zones
- Some jumps are unique to a single zone
- Common jumps are the same size in all zones, so resulting daily average prices are nearly identical
- Differences across zones drive TCR/CCR pricing, without basis adjustment

Key exposure modeling assumptions or issues

Non-market event driven defaults	▪ Defaults for this QSE type are randomly assigned to days within the analysis horizon
Market-event driven defaults	▪ Users specify the fraction (X%) of the highest priced periods for potential default events ▪ Defaults by price sensitive QSE types are randomly assigned to days within this fraction
Volume escalation or ramping potential	▪ QSEs are identified by ramping-type to reflect the business' potential for increasing its participation in the BES market ▪ For the high ramping types, historical average participation is ramped to Z% of maximum, where Z is user specified
Default mode drives exposure period	▪ The number of days over which volumetric exposure to BES prices occurs is driven by the default mode ▪ Two modes are currently considered; mass transition and margin call

Key collateral modeling assumptions

Simplified EAL and NLRI metrics

- Calculation focuses on exposure due to price and volume movements in the BES (or RT, DAM and CRR) markets

Exclude other factors (OUT, TCR, PU)

- Assume that these would be constant across multiple simulations
- Want to focus on the drivers of loss with regard to exposure and collateral

Haircuts for collateral types

- Haircuts may be applied to different collateral types based on estimated recovery rate (e.g. guarantees)

Key results captured and reported

Overall results

- Graphic distribution of losses
- Used to assess adequacy of number of simulations, reasonableness of parameters

Central results

- Mean loss level; used as an estimate of the expected losses (EL) that are typical of this business environment
- Standard deviation of EL, known as the unexpected loss (UL); used to gauge the stability of the EL

Tail results

- Specified percentile losses (e.g., 99^{th0}%, 95^{th0}%); used to determine economic capital requirements
- Simulation details for some tail scenarios; used to investigate the loss modes for extreme loss cases

Next steps

- Currently testing the credit loss model and parameterizing the model for the current market
  - Initial analyses show the methodology to be functional and responsive
- Oliver Wyman plans to deliver the completed capital adequacy model on November 16th
- As discussed today, the model will include:
  - Ability to manipulate key inputs to allow for stress testing
  - Loss distributions and key outputs for analysis of particular simulations
  - Capability to calculate Potential Future Exposure for a given counterparty over a specified horizon
- A report will document our estimate of ERCOT's baseline economic capital requirement at the 99th percentile level under current market conditions
- ERCOT will explore the methodology further, and test the assumptions and results before accepting the credit loss model and baseline economic capital estimation.
  - Nov 07 through Jan 08; Review results internally and vet with market participants
  - Feb 19, 2008; Present findings to full Board of Directors

Appendix

Supplemental material

The short list of proposed financial factors for un-rated entities covers the key considerations of assessing credit risk

Category	Proposed factors	Rationale
Liquidity	▪ **Working Capital/Sales** ▪ Cash/Assets ▪ Current Ratio	▪ Liquidity measures evaluate the company's ability to meet its short term obligations, which is particularly important given the short term payment and margin structure of the ERCOT market
Debt Service	▪ **EBITDA/Interest Expense** ▪ Free Cash Flow/Debt	▪ High levels of debt can increase the risk of default because a portion of available funds must service the debt leaving fewer funds to service other obligations
Leverage	▪ **Total Debt/Total Capital** ▪ Equity/Assets	▪ The more levered a company becomes the higher their risk of default, because small losses relative to asset size are magnified relative to equity as leverage increases
Profitability	▪ **EBITDA/Sales** ▪ Net Income/Assets	▪ The more profitable the company, the more capital they have to invest, service debt, and collateralize, all of which will help to lower the risk of default
Size	▪ **Total Assets**	▪ Larger companies tend to have larger capital pools and customer bases, which will help them remain solvent in market downturns compared to smaller companies
Activity	▪ **Sales/Assets**	▪ A large amount of activity in the market relative to a company's asset base could put the company at risk in volatile markets, as exposures can increase rapidly without a matching increase in assets

Quantitative factor definitions

All definitions are annual unless otherwise stated

Category	Factor	Definition
Activity	Sales/Assets	▪ Sales: Total revenue ▪ Assets: Total assets
Debt service	EBITDA/Interest Expense	▪ EBITDA: Earnings before interest, taxes, depreciation and amortization ▪ Interest expense: Interest paid on debt and other borrowings (including on capital leases)
Debt service	Free Cash Flow/Debt	▪ Free cash flow: Cash flow from operations – capital expenditures (funds used to buy fixed assets or add to the value of an existing fixed asset; usually termed “Investment in Plant Property & Equipment”) ▪ Debt: Principal and interest payments on debt and debt equivalents due within the next 12 months
Leverage	Total Debt/Total Capital	▪ Total debt: Long and short term debt ▪ Total capital: Tangible net worth (total shareholders’ equity less Goodwill or other intangible assets)
Leverage	Equity/Assets	▪ Equity: Total shareholders’ wealth (for co-ops: patronage capital; for munis: net assets) ▪ Assets: Total assets
Liquidity	Cash/Assets	▪ Cash: Cash and cash equivalents ▪ Assets: Total assets
Liquidity	Current Ratio (Current Assets/Current Liabilities)	▪ Current assets: Assets which are due in less than one year ▪ Current liabilities: Liabilities which are due in less than one year
Liquidity	Working Capital/Sales	▪ Working capital: Current assets - current liabilities ▪ Sales: Total revenue
Profitability	Net Income/Assets	▪ Net Income: Net income, after taxes, minority interest, and extraordinary and other after-tax items ▪ Assets: Total assets
Profitability	EBITDA/Sales	▪ EBITDA: Earnings before interest, taxes, depreciation and amortization ▪ Sales: Total revenue
Size	Total Assets	▪ Total assets: Total assets

The qualitative factors incorporate information about an un-rated entity's experience and behavior in ERCOT's market that may not be captured in financials

Category	Selected factors	Rationale
Risk policies and procedures	▪ Risk management policies and practices ▪ Quality and timeliness of financial reporting	▪ Effective risk management policies and reporting help the company as well as ERCOT detect and prevent negative credit events
Management Quality	▪ Experience of company leadership	▪ Past experience and performance in managing within ERCOT's protocols demonstrates an ability to handle market fluctuations and remain creditworthy
Relationship with ERCOT	▪ Margin call and late payment history	▪ Companies that are able to avoid margin calls and late payments by holding sufficient collateral for their operation in the ERCOT market or those that are responsive to notifications may be better positioned to avoid late payments (and potential default) during volatile markets
Performance/ Strategy	▪ Ability to access funding in difficult market environment	▪ In difficult market environments the ability to access additional cash is critical since it is in these environments the company can experience extreme requirements
Industry characteristics	▪ Recent growth ▪ Length of time as QSE	▪ The diversification and growth of a company coupled with the company's ability to sustain itself through multiple market environments can buffer economic shocks and lessen the company's probability of default

Correlation of the drivers of default

QSE defaults are likely correlated by common drivers

- Probabilities of default are user inputs, intended to feed directly from the internal credit scoring model
- Each QSE is associated with a “default correlation” type
  - These types are based on common drivers of default
  - These common drivers systematically increase the probability of QSEs within the same type (and across types) defaulting together
  - Selection of “default correlation” types should attempt to best segment the QSEs by common default drivers
- These “default correlation” types are based on the primary business of each QSE

Default correlation type	Business	Definition
1	Generation	> 70% of combined load and generation volume is generation[1]
2	Small load	< 10,000 MWh/day of load (and < 30% of combined load and generation volume is generation) [1]
3	Large load	> 10,000 MWh/day of load (and < 30% of combined load and generation volume is generation) [1]
4	Trading	Minimal load or generation
5	Public power	Munis and coops
6	Mixed	Relatively balanced mix of load and generation

1 Based on average activity for a recent month.

Default events are correlated based on business type

	Generation	Small load	Large load	Trading	Public power	Mixed
Default type	**1**	**2**	**3**	**4**	**5**	**6**
1 Generation	20%					
2 Small load	0%	30%				
3 Large load	0%	20%	25%			
4 Trading	0%	0%	0%	10%		
5 Public power	10%	5%	10%	0%	20%	
6 Mixed	10%	5%	5%	5%	10%	20%

- Each individual QSE is assigned a “default correlation” type based on their business
- The correlations determine the likelihood that QSEs will default within the same timeframe, driven by the same underlying factors
- In other industries, default correlation within industry segments is 20-30%
- The correlations proposed are subjective, based on the business risk factors present in these enterprises

Defaults can either be market driven or non-market driven

"Market event sensitivity" types are used to determine how a QSE may have defaulted

- "Market event sensitivity" types are identified based on the likelihood of QSE defaults being closely associated with market events (e.g., price jumps)
  - If certain QSEs are more likely to have defaults near market events (high price days), the model needs to reflect this in order to accurately calculate exposure
- If the QSE's default is identified as being related to a market event, the prices near the default day are above a specified percentile
- If the QSE's default is identified as having no relation to a market event, the day of default will be randomly chosen over the time horizon of the analysis

Type	Description	Probability of defaulting near a "high price day"	"High price day" is defined as those in the upper
1	High sensitivity to market events	80%	90%
2	Low sensitivity to market events	20%	90%

- Depending on a counterparty's market event sensitivity and type, volume escalation scenarios will be linked accordingly

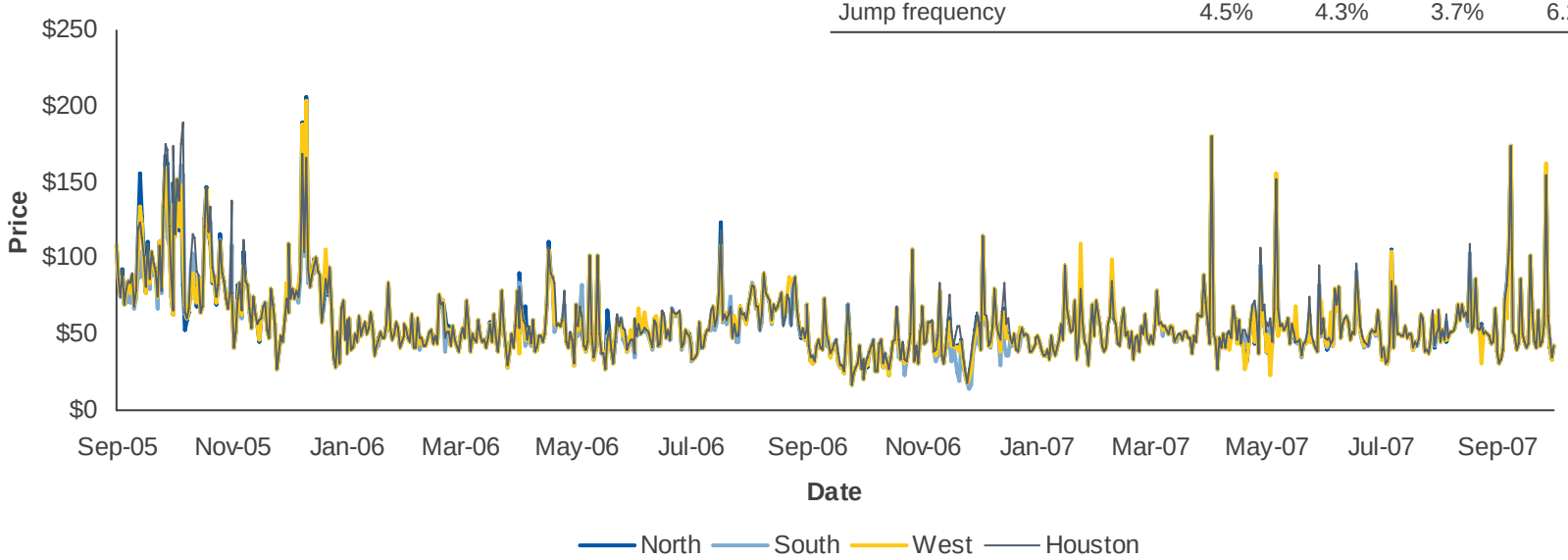
Note: "High price day" is defined as a four-day rolling average

Price jump analysis

Illustrative

- Identify jump cutoff levels
- Attempt to leave jumps and residual price changes “normal”
- Assumptions include
  - One common cutoff level vs individual cutoffs
  - Identical size jumps for concurrent events
  - Simple average daily prices vs weighted averages

Jump cutoff	105	103	107	98
Observed price days	760	760	760	760
Observed jump days	34	33	28	47
Avg jump size (above mean)	76.1	68.9	78.3	69.5
St dev jump size	27.8	23.0	27.2	27.0
Skew[1]	0.922	0.937	0.930	0.887
Kurtosis[2]	-0.091	-0.346	-0.033	-0.648
J-B test for normality	4.687	4.357	3.998	4.892
Normal?	Normal	Normal	Normal	Normal
Jump frequency	4.5%	4.3%	3.7%	6.2%



1 Skew characterizes the degree of asymmetry of a distribution around its mean.
2 Kurtosis characterizes the relative peakedness or flatness of a distribution compared with the normal distribution.

Market price characteristics and parameters

Price parameters were directly calculated from or informed by historical ERCOT price data and can be set distinctly for each hub, and adjusted

Correlation of normal daily price movements among locations

	North	South	West	Houston
North	100%	87%	92%	91%
South	87%	100%	86%	90%
West	92%	86%	100%	86%
Houston	91%	90%	86%	100%

Prices for nodal can be simulated using adjusted parameters

New correlation matrix

Correlation between RT and DAM expected to be very high (> 95%)

New jump parameters for DAM

May include smaller, less frequent jumps

Jump parameters

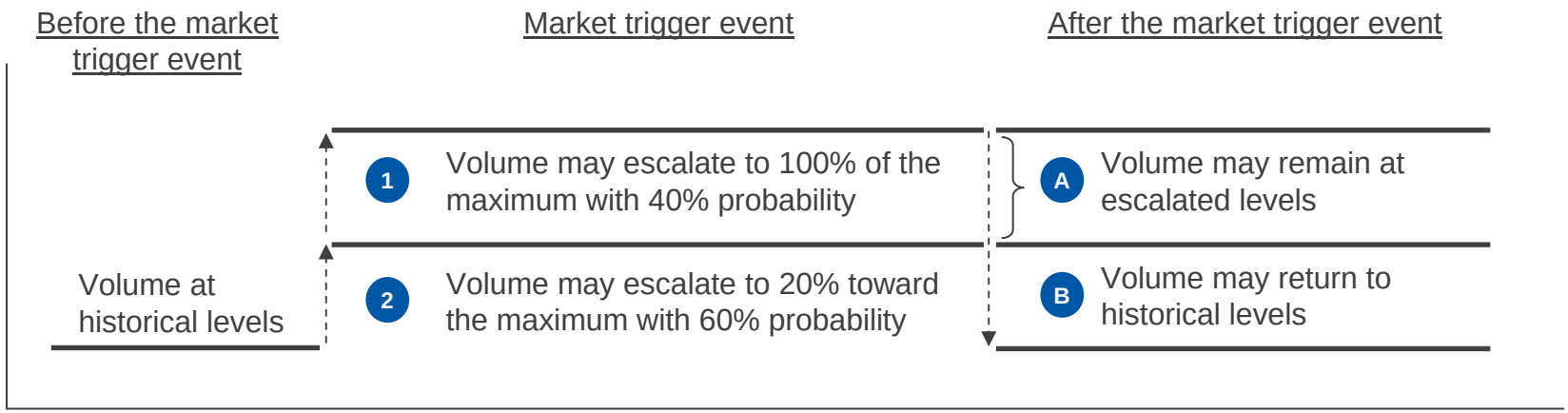
Category	Ranges now	Suggested for $3,000 cap or change in activity
Frequency of jump days	4.6-5.6%	7-10%
Percent likelihood of a 1-, 3- , or 6-day jump series	79%, 17%, 4% respectively	75%, 20%, 5% respectively
Frequency of jumps common to multiple zones	80%	80%
Average jump size (above base price)	64-69 $/MWh (1.2 hr / day)	~ 120 $/MWh (1 hr/day)[1]
99th % highest expected jump (reflects price cap in desired market design)	123-147 $/MWh (2.25 hr / day)	~ 375 $/MWh (3 hr/day)[1]

1 Hours / day still to be validated.

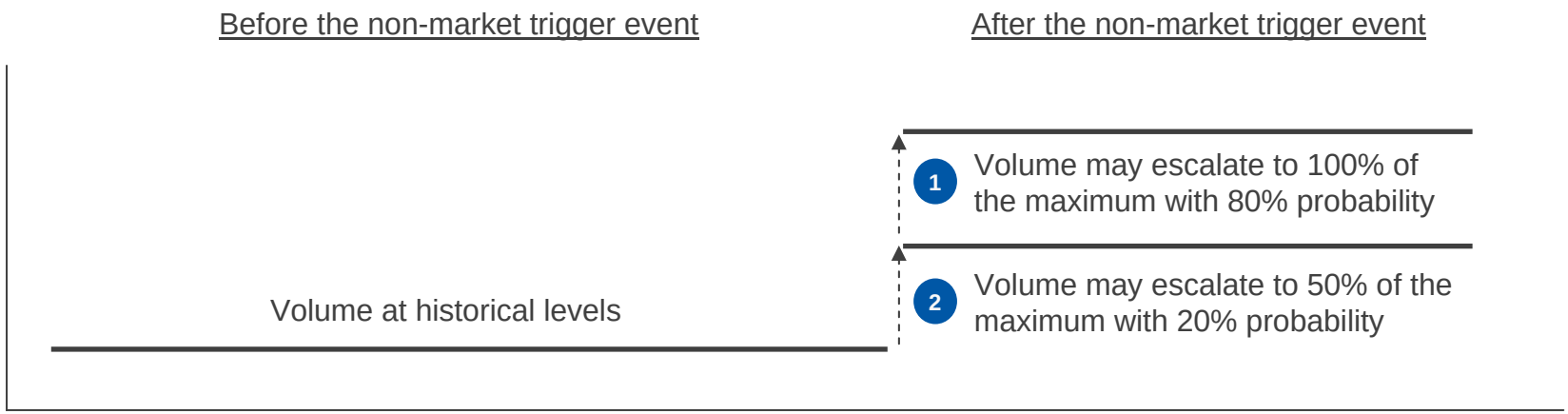
Our approach to volumetric exposure allows for a range of possible scenarios

Illustrative

Simple example 1 – Volumetric exposure during a market event for a load-serving QSE



Simple example 2 – Volumetric exposure during a non-market event for a load-serving QSE



Volume escalation can vary for different QSE types

Market events drive this kind of default scenario

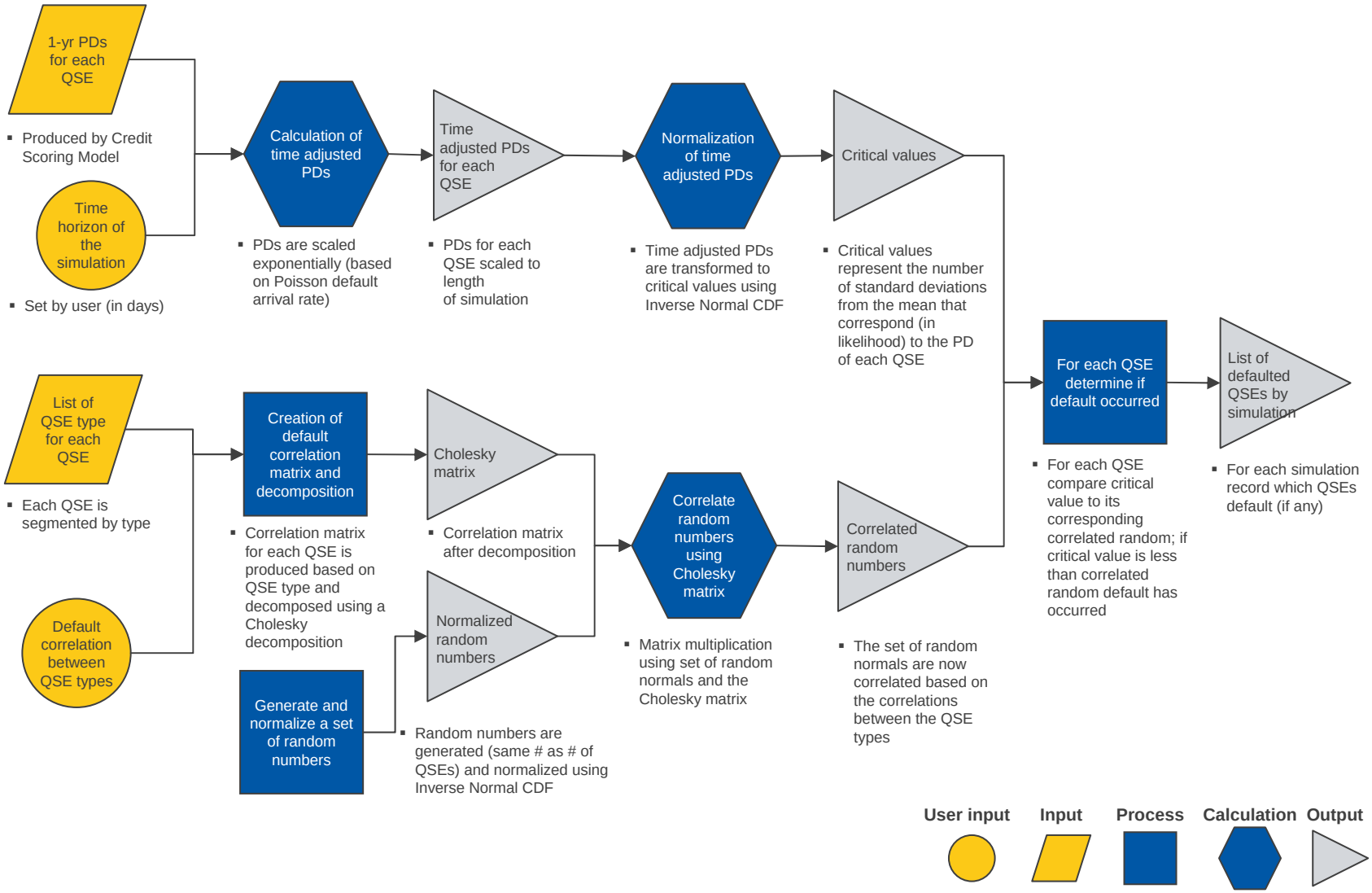
Defaulting entity during a market trigger event

		Increase sales to BES by up to 10%	Reduce purchases from BES to 0	Maintain the same level	Incr purch from BES to up to 20%	Incr purch from BES from 20 to 50%	Incr purch from BES to 100%
Generation		10		50	35	5	0
Small load	<10%		5	20	40	10	25
Small load	100%			100			
Large load			5	55	35	5	0
Trading		Estimate as a percentage of historical activity					
Public power			5	55	35	5	0
Mixed			5	55	35	5	0

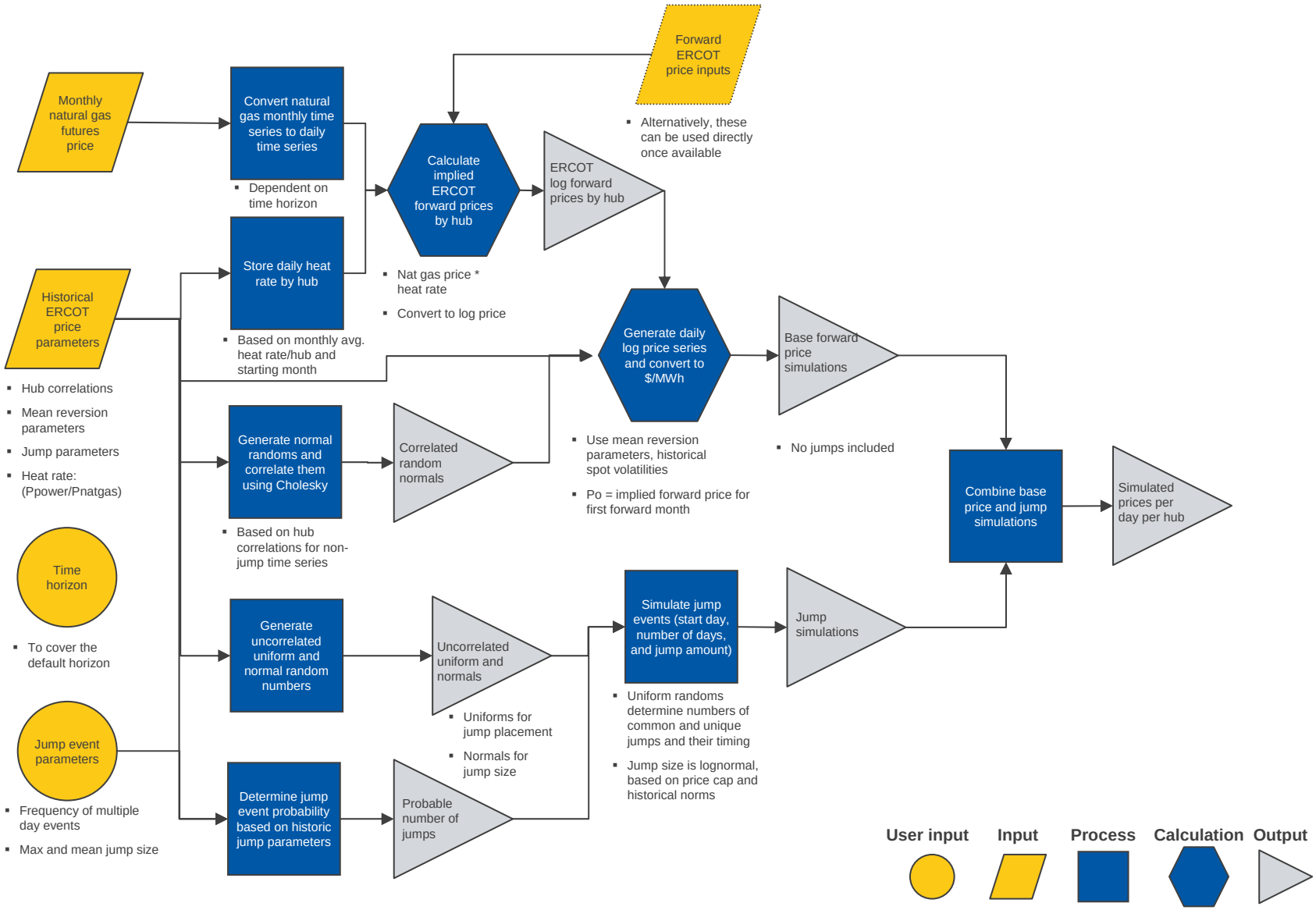
Defaulting entity after a market trigger event

	Revert to history	Remain at same level in BES	Go to 100%
Generation	50	50	
Small load		30	70
Small load		100	
Large load	50	50	
Trading	100		
Public power	50	50	
Mixed	50	50	

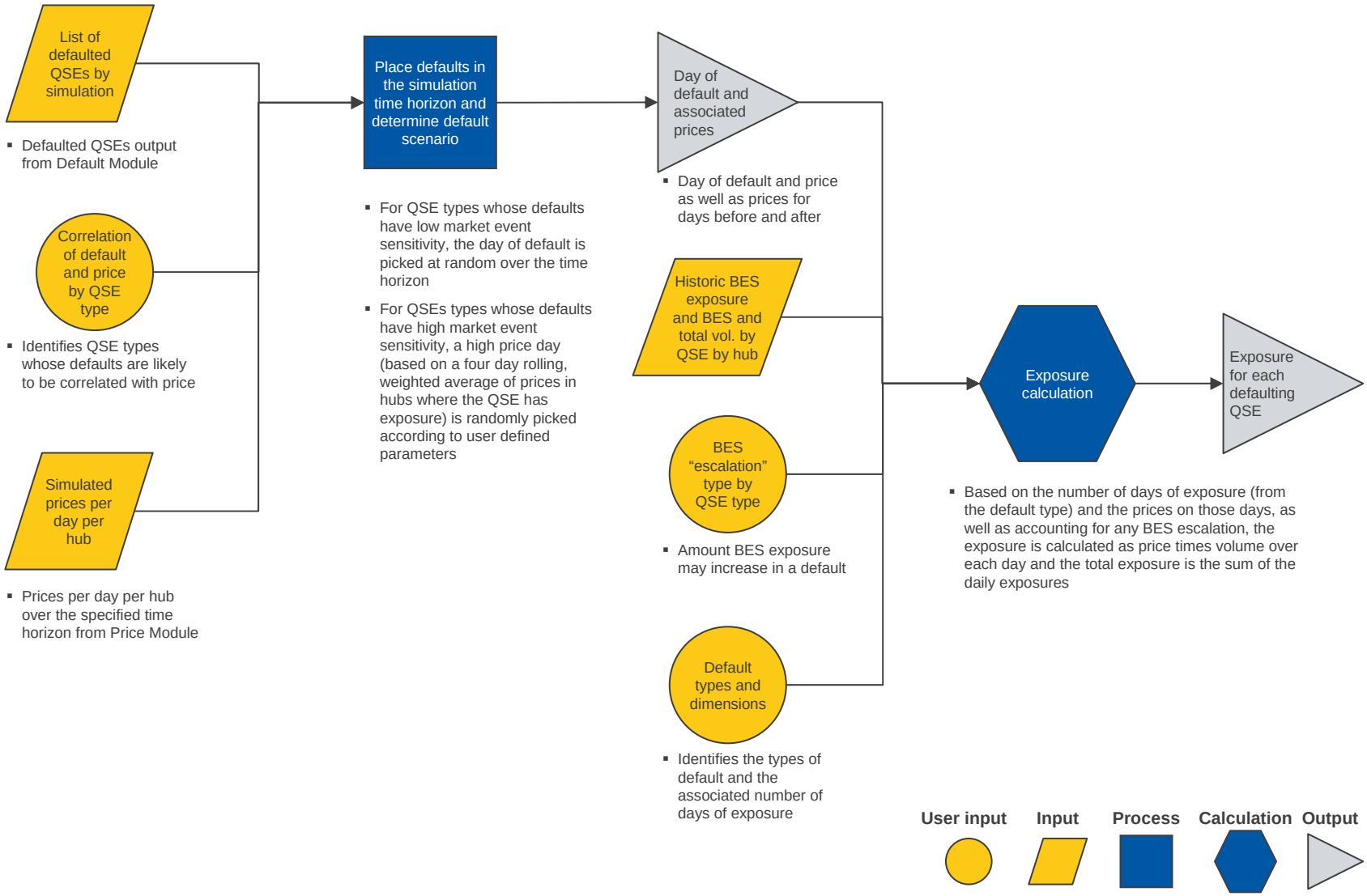
Default module schematic



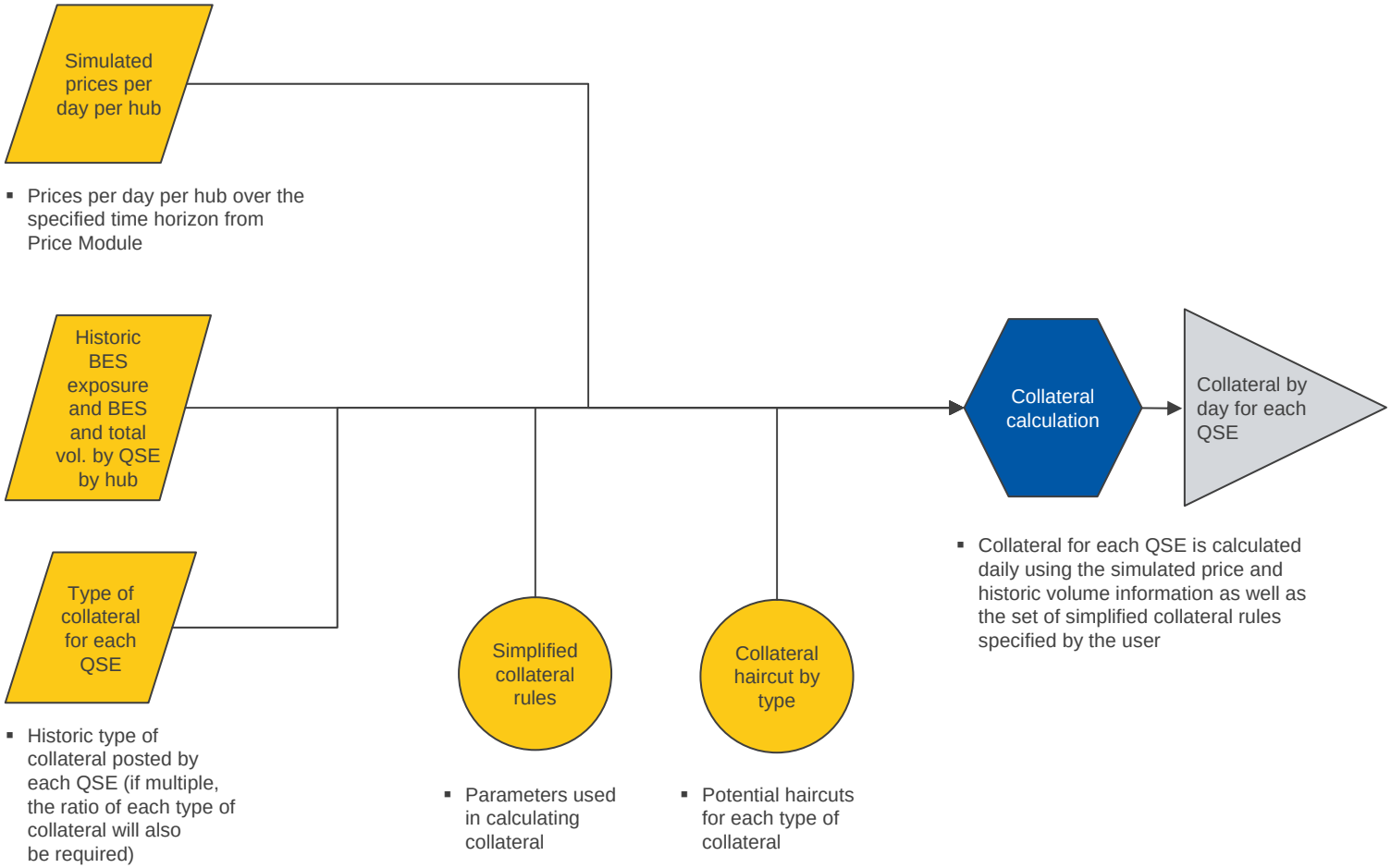
Price module schematic



Exposure module schematic



Collateral module schematic



- Prices per day per hub over the specified time horizon from Price Module
- Historic type of collateral posted by each QSE (if multiple, the ratio of each type of collateral will also be required)
- Parameters used in calculating collateral
- Potential haircuts for each type of collateral
- Collateral for each QSE is calculated daily using the simulated price and historic volume information as well as the set of simplified collateral rules specified by the user

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