

Enterprise Risk Management at Chelan County PUD

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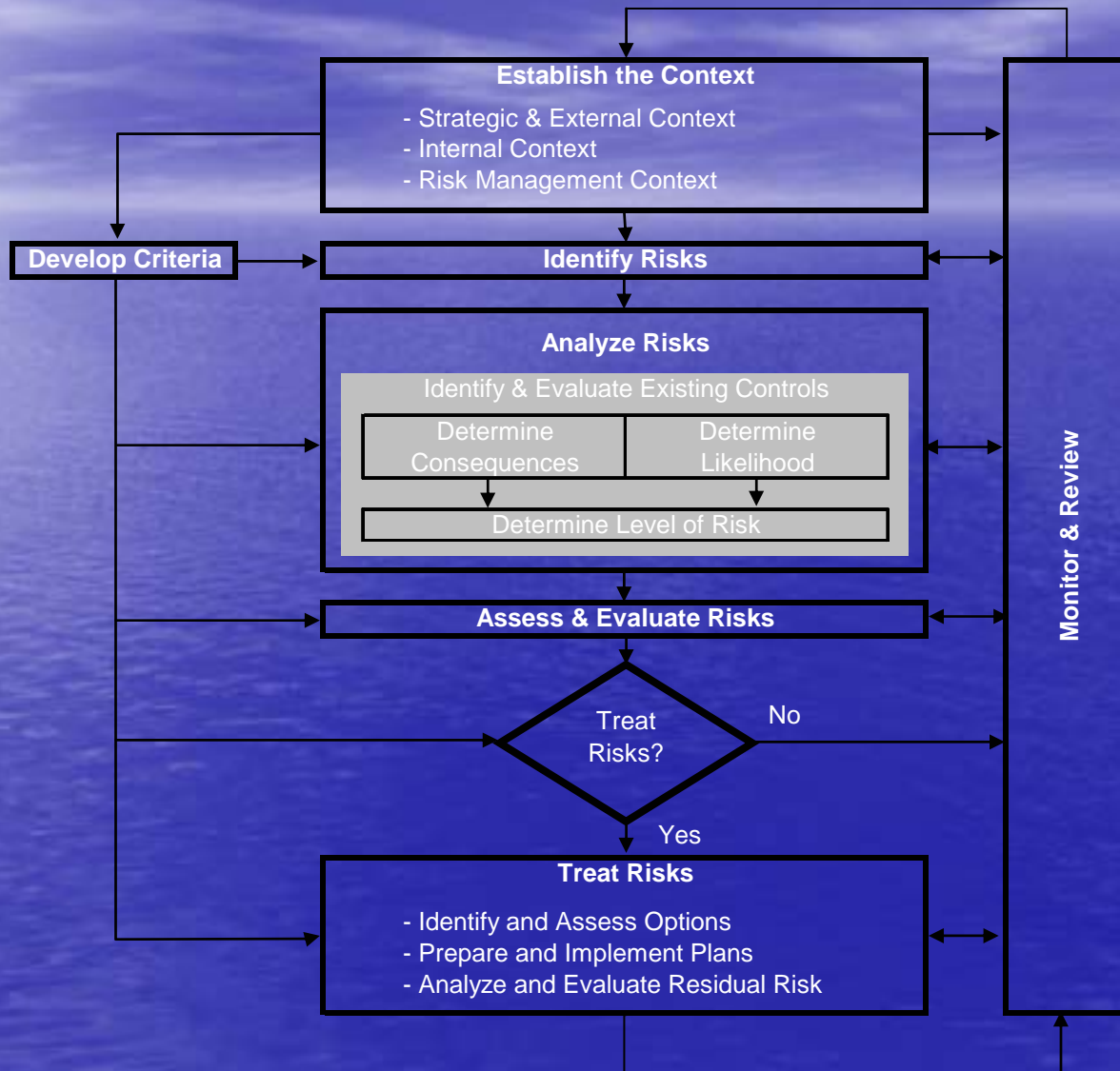
Enterprise Risk Management

- Brief History and Definition of ERM
- Risk Measurement
 - Quantitative, Qualitative and Semi-Qualitative
 - District Examples
- Current Status
- Next Steps (2008)
- Potential Next Steps (beyond 2008)
- Questions?

ERM Defined

- **The Committee of Sponsoring Organizations of the Treadway Commission (COSO):** "a process, effected by an entity's board of directors, management and other personnel, applied in a strategy setting across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives."
- **The Australia/New Zealand Standard (AS/NZS):** "a logical and systematic method of establishing the context, identifying, analyzing, evaluating, treating, monitoring and communicating risks associated with any activity, function or process that will enable organizations to minimize losses and maximize opportunities."
- **The Committee of Chief Risk Officers (CCRO):** "the program or process enacted to identify, assess, quantify and respond to the complete set of risks facing a firm in an integrated fashion."
- **The Casualty Actuarial Society (CAS):** "ERM is the discipline by which an organization in any industry assesses, controls, exploits, finances and monitors risks from all sources for the purpose of increasing the organization's short- and long-term value to its stakeholders"

Risk Management Process



Framework Definitions

- **Establish the Context**
 - Establish external, internal and risk management context – establish criteria against which risk will be evaluated and the structure of the analysis defined.
- **Identify Risks**
 - Identify what, why and how things can arise as basis for further analysis.
- **Analyze, Evaluate & Aggregate Risks**
 - Identify existing controls, analyze risks in terms of consequences and likelihood in the context of those controls.
 - Consider range of potential consequences and how likely those consequences are to occur (consequences and likelihood can be combined to produce an estimated level of risk).
 - Aggregate similar risks across the organization to get a picture of key risk drivers.
 - Compare estimated levels of risk against pre-established criteria in order to identify management priorities.
- **Treat Risks**
 - Develop and implement specific treatment plans – after considering cost / benefit. Accept and monitor low-priority risks.
- **Monitor and Review**
 - Monitor and review performance of treatment plans, assess current environment for new risks as well as changes that might impact previously identified risks.

Common Risk Categories or Types

Market

Risk arising from unexpected changes in market supply, demand, price or rate

Technology

Risk arising from an organization's inability to implement or manage IT systems or applications

Strategic

Risk arising from an organization's inability to formulate and/or execute a successful business strategy

Legal

Risk arising from contracts or other arrangements that are not enforceable through available means

Information Systems

Risk arising from inadequate information technology resources or inappropriate use of available resources

Reputation

Risk arising from changes in public opinion that impact change in net assets or access to capital

Human Resources

Risk arising from inadequate human resources or inappropriate use of existing resources

Regulatory

Risk arising from unexpected changes to local, regional or federal law or regulatory policy

Terrorism

Risk arising from act of terrorism

Health and Safety

Risk arising from lack of or noncompliance with health and safety regulations, policies or procedures

Political

Risk arising from the actions of local, regional or federal governments or special interest groups

Financial

Risk arising from deviation of business financing costs from original estimates

Operational (Process Failure)

Risk arising from inadequate risk control or failure of risk infrastructure

Operational (Asset Failure)

Risk arising from inadequate physical infrastructure

Environmental

Risk arising from noncompliance with local, regional or federal environmental laws or regulations

Model and Validation

Risk arising from incorrect assumptions or data – or the inappropriate application of a model

Credit

Risk arising from inability or unwillingness of a counterparty to pay or perform

Natural Disaster

Risk arising from extreme natural events such as storms, floods and earthquakes

Risk Measurement

Measures Needed to Manage Risk

Risk Measurement

Prerequisites for Quantitative Modeling

- ❑ **Statistically relevant historical data samples, e.g.**
 - Market Prices
 - Outage information
 - Load data
- ❑ **Applicable modeling and simulation technique, e.g.**
 - Closed form solutions
 - Monte Carlo Simulation

available

- ❑ **Apply quantitative modeling and simulation techniques**
 - Market Risk
 - Credit Risk
 - Volumetric Risk

not available

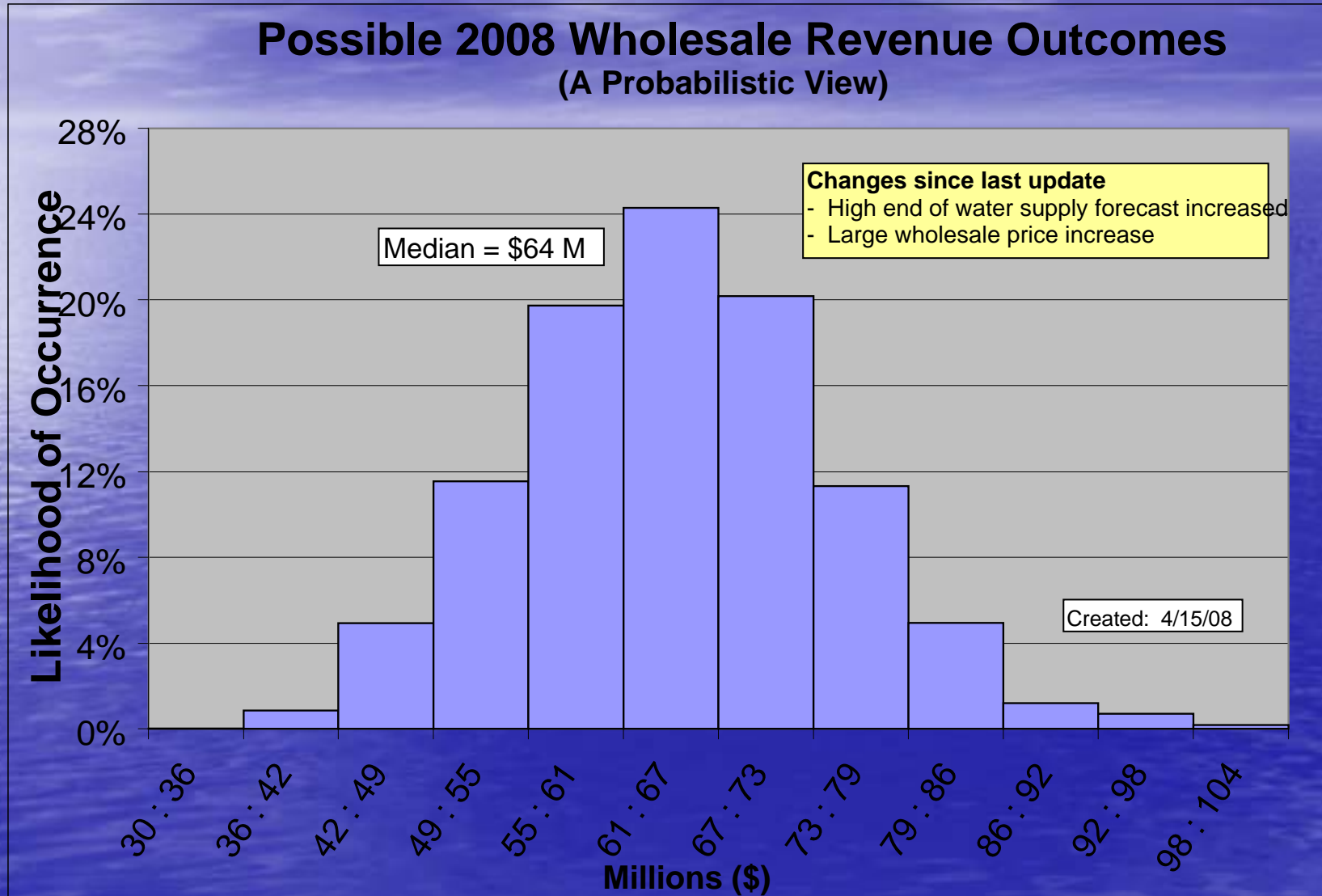
- ❑ **Apply qualitative techniques**
 - What-if scenario analysis
 - Influence diagrams
 - Decision trees

Are there other risks where quantitative modeling can be applied?

Don't forget stress testing!!

Risk Measurement

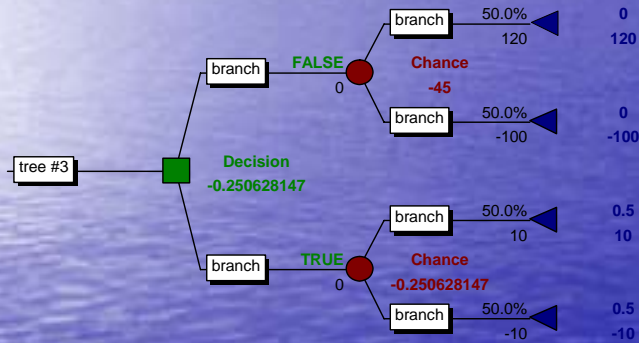
Quantitative Measurement Technique



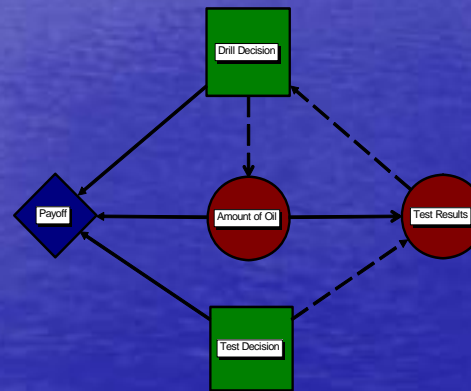
Risk Measurement

Qualitative Measurement Techniques

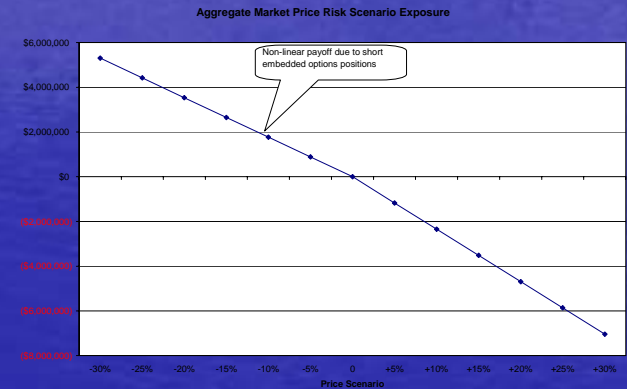
Decision Trees



Influence Diagrams



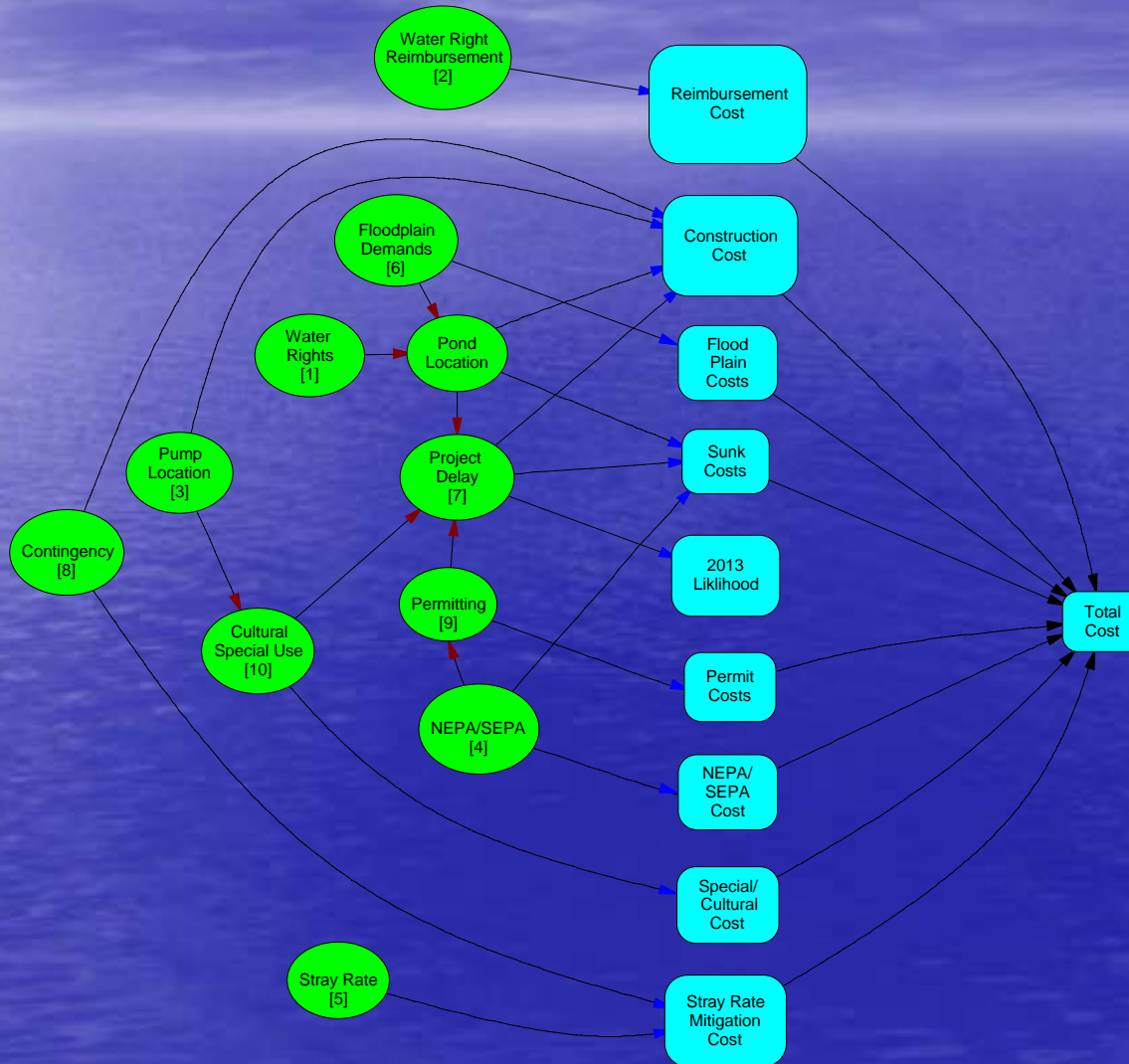
Stress Tests



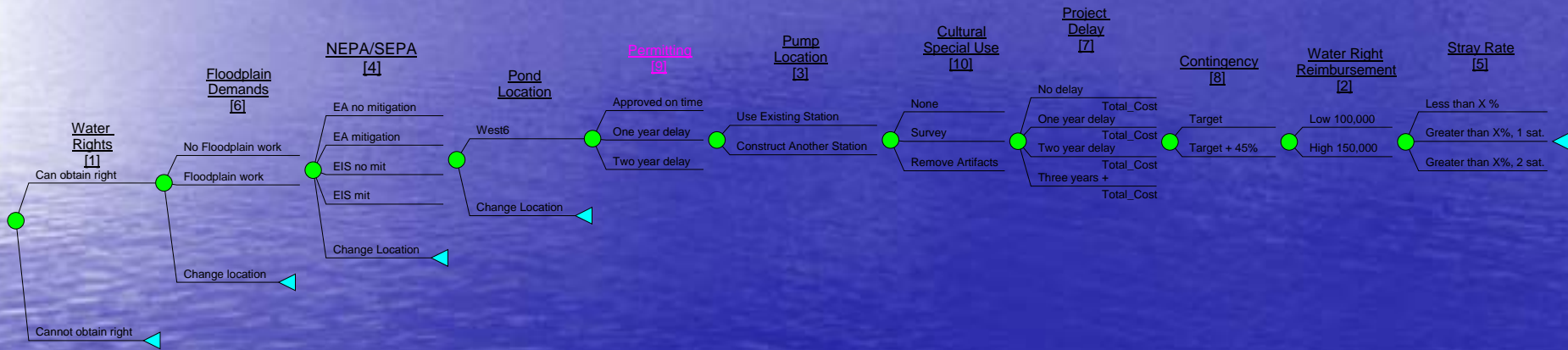
Risk Measurement

District Examples

Sample Project Influence Diagram

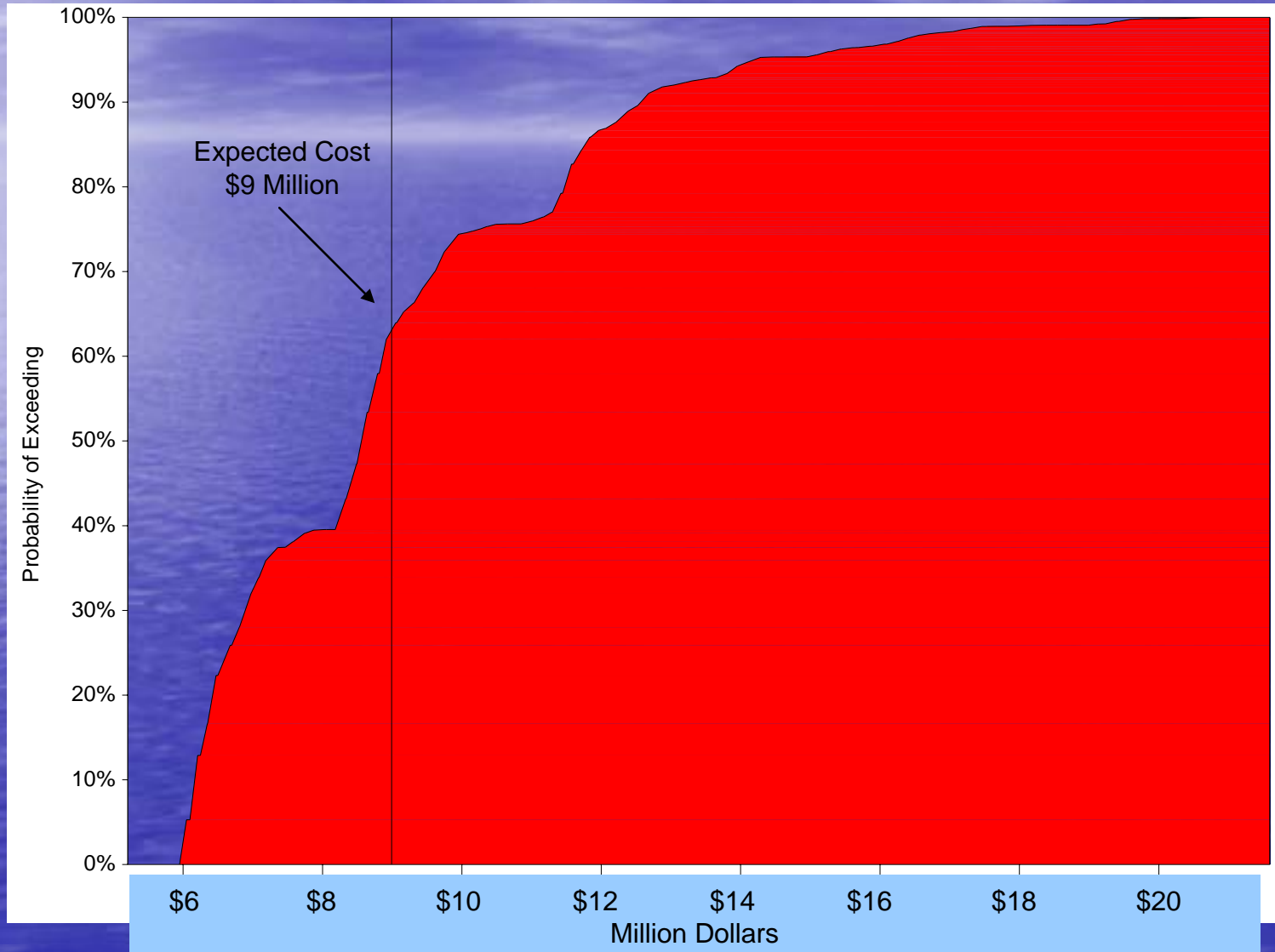


Project "Risk Map" (decision tree)

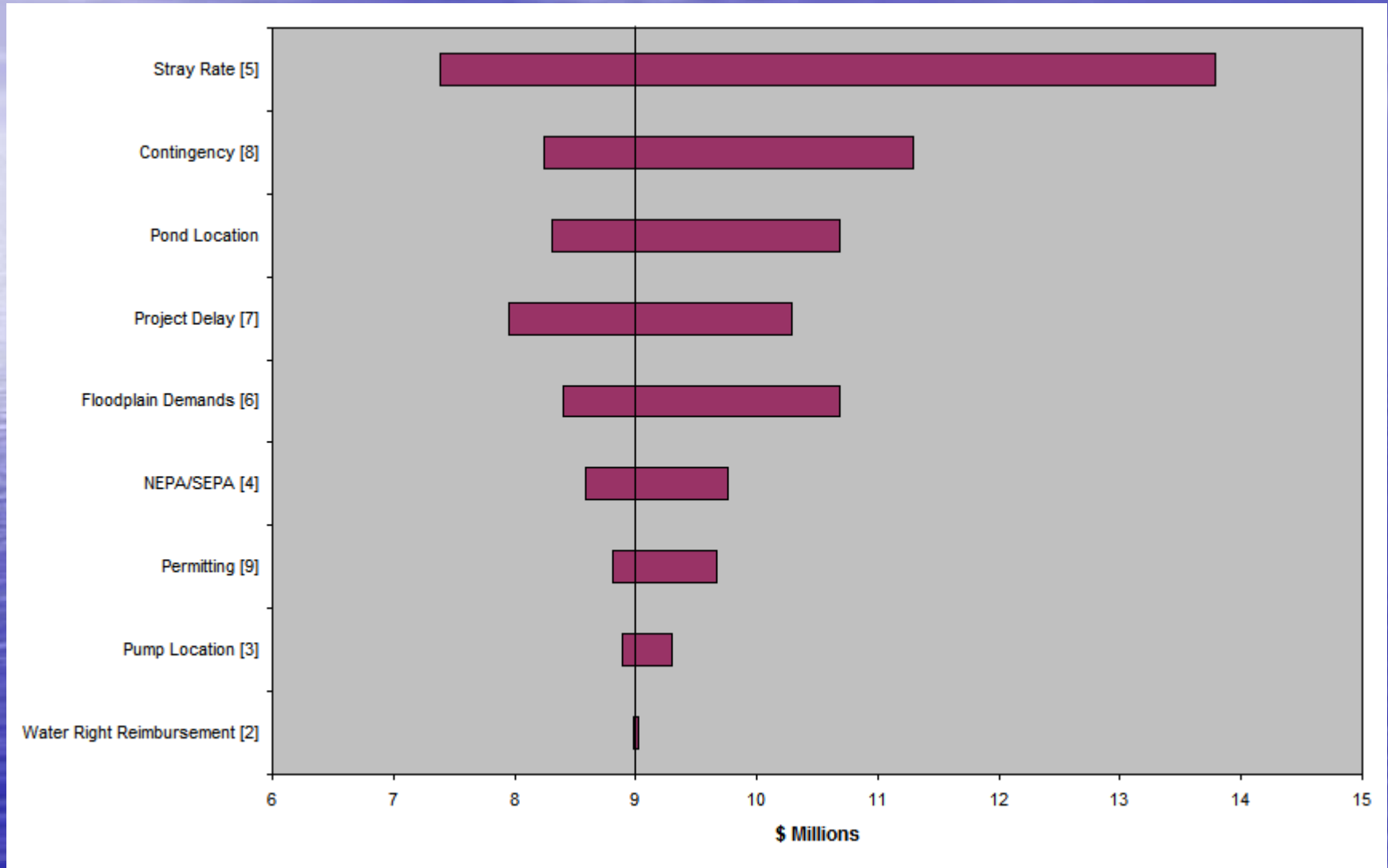


Sample Project Cost Distribution

Semi-Quantitative Measurement Technique



Sample Project Sensitivity Analysis (Tornado Diagram)



Commodity, Currency & Interest Rate Exposures

Notional Position Exposure Report (Illustrative - Example Only)

<u>Year</u>	<u>Carbon Steel</u> (lbs)	<u>Stainless Steel</u> (lbs)	<u>Ferrochrome</u> (lbs)*	<u>Nickel</u> (lbs)*	<u>Ferro-molybdenum</u> (lbs)*	<u>Ferrous Scrap - Stainless</u> (lbs)*	<u>Copper</u> (lbs)	<u>Unleaded</u> (gals)	<u>Diesel</u> (gals)	<u>\$CDN</u> (\$US)	<u>EUR</u> (\$US)	<u>Interest Rates</u> (\$US)
2008	511,150	149,300	37,279	11,471	1,721	236,294	57,100	135,672	126,768	13,709,888	1,336,714	400,000,000
2009	838,850	298,600					104,900	135,672	126,768			300,000,000
2010	655,400	298,600					95,600	135,672	126,768			200,000,000
Total	2,005,400	746,500	37,279	11,471	1,721	236,294	257,600	407,016	380,304	13,709,888	1,336,714	900,000,000
Prices/Rates + 20%	(162,036)	(689,393)	(10,289)	(31,920)	(12,216)	(59,841)	(191,139)	(210,834)	(217,534)	(2,716,477)	(391,042)	5,400,000
Prices/Rates - 20%	0	0	0	0	0	0	0	210,834	217,534	2,716,477	391,042	(5,000,000)

- (1) Metals positions estimated from Rock Island and proposed Lake Chelan modernization contracts
 - (2) Fuel positions estimated from info obtained from Gary Lentsch
 - (3) Currency positions estimated from recent Lake Chelan modernization contract (pre-currency lock)
 - (4) Interest rate "Gap" = estimated rates sensitive assets minus rate sensitive liabilities
- *implied position, in pounds

Prioritization and Monitoring


Impact vs. Probability (Heat Map)

Significance	Extreme	Significant 5	Major 10	High 15	Severe 20	Severe 25
	Very High	Moderate 4	Significant 8	Major 12	High 16	Severe 20
	Medium	Low 3	Moderate 6	Significant 9	Major 12	High 15
	Low	Trivial 2	Low 4	Moderate 6	Significant 8	Major 10
	Negligible	Trivial 1	Trivial 2	Low 3	Moderate 4	Significant 5
		Rare	Unlikely	Moderate	Likely	Almost Certain
		Likelihood				

The background is a vertical gradient of blue, transitioning from a lighter, hazy blue at the top to a deeper, more saturated blue at the bottom. On the left side, there is a bright, glowing area that resembles a sun or a light source, with a soft, white-to-yellow glow that fades into the blue. The overall effect is a serene, oceanic atmosphere.

Current Status

ERM Capability Maturity Model



Maturity	Description	Commentary
Level 5 Strategic	Risk Management is built into decision-making. The organization selectively seizes opportunities because of its special ability to effectively manage risks.	<ul style="list-style-type: none"> •Focus on value creation and preservation •Institutionalized •Confidence in ability to manage risks based on track record
Level 4 Integrated	Risks are treated as a portfolio at the enterprise level and are correlated and aggregated across risk types and business units.	<ul style="list-style-type: none"> •Calculation of risk measures that can be aggregated •Risk treatment integrated and costs optimized
Level 3 Comprehensive	Risk management is enterprise-wide and encompasses all risk types including strategic and operational.	<ul style="list-style-type: none"> •Risks clearly linked to strategic objectives •Defined and documented •Forward looking •Clear accountability
Level 2 Fragmented	Risk management functions independently within business units. Risk types managed are limited to hazard, financial and compliance.	<ul style="list-style-type: none"> •Capabilities vary across Bus •No cross-BU coordination •Some expertise within limited number of risk types such as market, credit, hazard
Level 1 Initial/Ad Hoc	Risk management activities are ad hoc. No overarching risk management philosophy or objectives are defined.	<ul style="list-style-type: none"> •Success depends on individuals •People are unaware of risks •Risks managed reactively
Level 0 Nonexistent	No risk management capabilities are in place. There is a lack of any recognizable process.	<ul style="list-style-type: none"> •Applies to new entities •Ephemeral state



Next Steps

Next Steps

- 2008 Priorities
 - Design and implement suitable risk management framework for two key functions:
 - Wholesale revenue generation (Energy Planning and Trading)
 - Habitat Conservation Plan (Natural Resources Division)
 - Evaluate additional “tools” to manage exposures
 - District-wide consultation and education
 - Focus on efficiencies (Governance/Risk/Compliance)
 - Anticipate and respond to industry changes and emerging practices



Potential Next Steps Economic Capital & Sustainability

Beyond 2008

Economic Capital

Bringing it all together – aggregating risks

Sources of Risk for
Economic Capital



- Price levels
- Price volatilities
- i-rates, currencies...



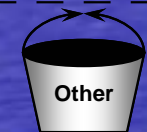
- Counterparty credit
- Contract abrogation...
- Credit concentrations



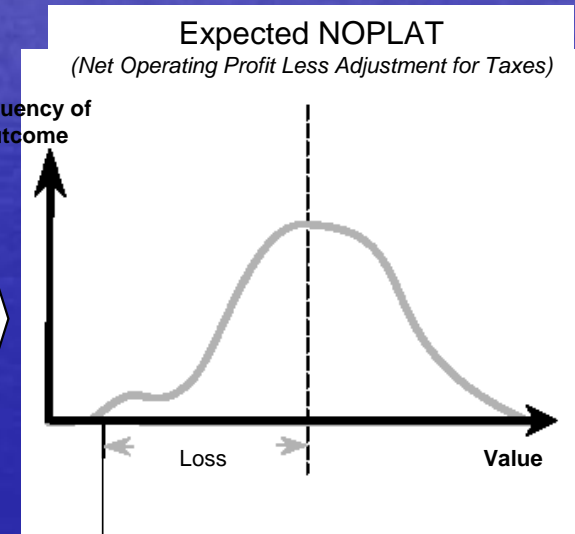
- Interruption
- Control failures
- Behavior...



- Generator outage
- Transmission outage
- Process efficiency
- Weather...

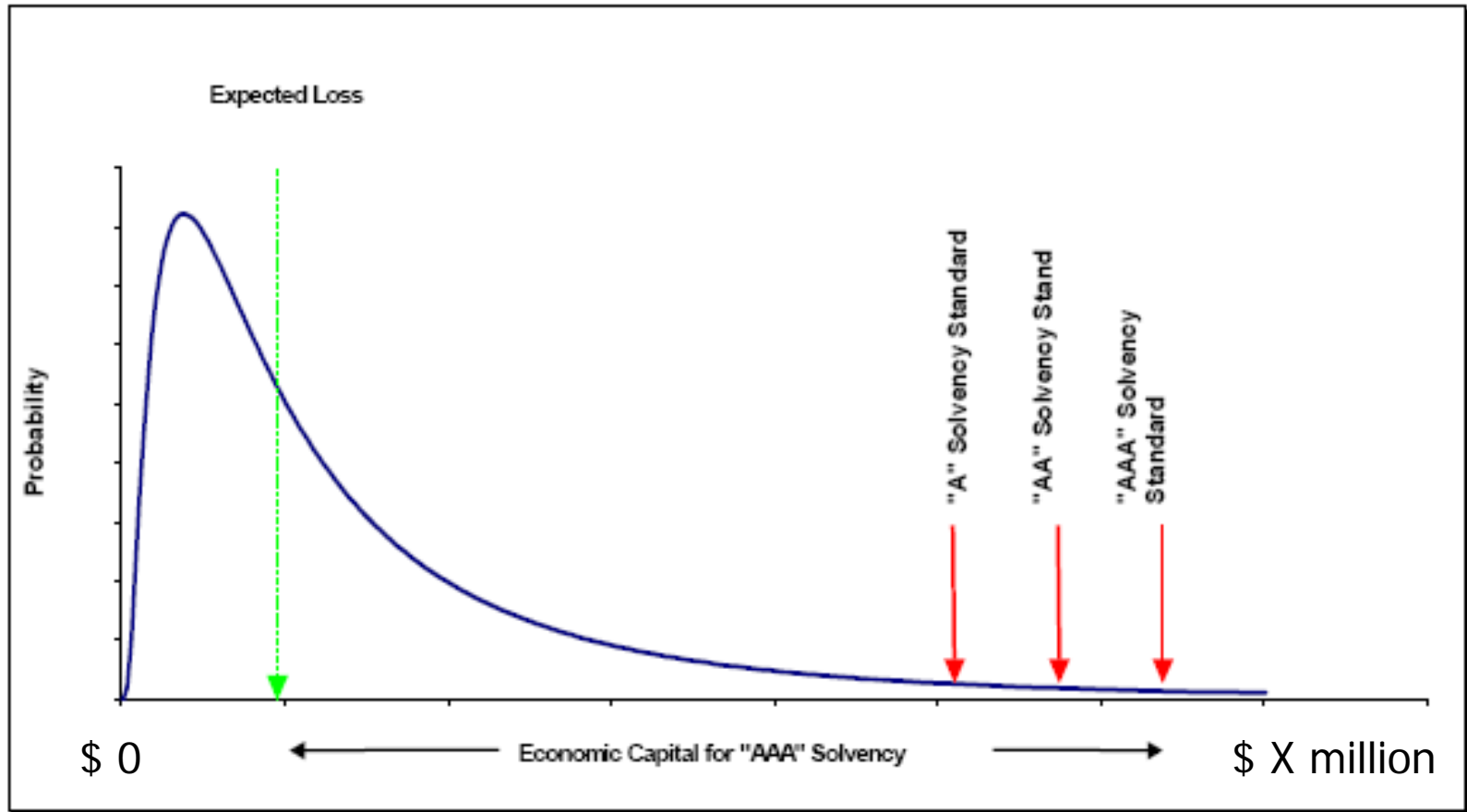


- Competitive landscape
- Change in law or regulation
- Infrastructure change...



Adapted from CCRO

Economic Capital Adequacy





Questions?