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<sup>1</sup> F<sup>1/2</sup> F F Fm Fz E/ Fm FNz/nCF<sup>1/2</sup> F  
o Fn FN<sup>1/2</sup>CF F F F Fz Fq F Fo F> FNzqLoO  
k F F F F F F F Fq F<sup>1</sup> F N<sup>1/2</sup>L/O  
F FXSW<sup>1</sup>TF<sup>1</sup> F F F F F F F F RF  
F F F F F FzqLo F F Fk T  
k RF F F F F F F F F F  
F F F F F F FzqLoF> Fz F<sup>1/2</sup> F Fo  
z N<sup>1/2</sup>ozOIF' F F F F F F Fk RF F<sup>1/2</sup> F  
F F F F F F F T  
<sup>1/2</sup> F F Fk zqLo F F F  
F F S F F F F F TFzqLoF>k F  
F F F F F T<sup>1/2</sup> F F FzqLoF  
F F F F F F F F F TFzqLoF F F  
F F F F F F F F F F TFk F F  
F F F F F F F F S F T  
s F F RFzqLoF F F F F F F F F  
F F F R F FFb k Fv Fk F£ z FCKvk£zOR  
F F F F F F F F F F  
F F F F F S F TzqLoF F F  
F F F F F F FN F F Fz<sup>1/2</sup>ozCF F  
F F y T RF F F F k F F F  
F TFzqLoF> F F F F RF Fz<sup>1/2</sup>ozF  
FB F TFC



' z Px ' Pyxz '

k F F F Fk Fm F> F½ Fw F Fk  
 NKTOWSWSWRF Fm Fz E/ Fm Nz/ nO ½ F  
 o Fn ½ NonO F F F F F Fz Fq F  
 o Fm F> FNzqLoF F F F F F F Fq F¹  
 F½ Nq¹ L½O F FXSWSWT¹ F½ F F ½onF F  
 FB zqLoF> F F F F F F F  
 FC TFk F F F F F½ Fw RFzqLoF> FFB  
 F F F F F F FzqLoF F F F F  
 TFC F½onF F F F F F F F F  
 F F F F F F FzqLo  
 Fk T  
 ½ F> F F F TFF¹ F F F F F F  
 F F F RF F RF F F FzqLo  
 F q¹ L½F TF¹ F F F F F F F F F F  
 Fm Fm F F F F F F  
 U F zqLoF F F F F  
 F F F TFF¹ F F F F F F F  
 F FzqLoF> z ½  
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z½ozF F F F Fm F FnTWSWSWRF F F F£ FNEBSWWT

WOL Fs  
XOL Fk  
YOL Fw

s F F F F F F F FzqLoF> F F  
RF F F F F F F RF F TF<sup>1</sup>  
m F F F F F F F F F FFB FC F F F TF F  
s F RF F F F F F F F F F F F F F F FFB  
FFB TFC FkF F F F F F F F F F F F F  
F F F F F F F F F F F F TF£ IF IF F  
F RF F F F F F F F F F F F F F F F  
F F F F F T  
s F F F F F RF F F F F F F F F F F  
F F F F RF F F F F F F F F F F F F  
F F F F F T  
£ F F F F F F F F F F F F F F F F  
F F F F F F F £ T F F  
F F F F U F F F F F F F F F F FT  
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F F F F F F F F T F F F F  
F F RF F F F F F F F F F  
T  
£ F F F F F F F F TFk F F RF  
F F F F F d

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n F Fs½FNs Fy F F½ CFq FaYdXWc



**"P "P "**

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s F F FzqLoF F F F F F F  
 RF<sup>1/2</sup>nF F FzqLoF F F F FFB FC  
 F F F F FTs F F F FzqLoF F F F  
 F F F eF F F F F F F F F  
 F F F F F F F F F  
 F F T  
 p F F F F F RF F F  
 F FzqLoF F F F F F F TFzqLoF  
 F F F F F F F FFB FC F F TF<sup>1/2</sup> F  
 F F F F F F F F F F  
 TF<sup>1/2</sup> F F F F F F F F F  
 F F F F F F F F F F F F  
 F F F F F FT F F F F RF F  
 F F F F F F F F F FzqLoF>F  
 F F F F F Fq<sup>1</sup>L<sup>1/2</sup>F Ts RF F F  
 F F F F F F F F F F> F F T  
 F<sup>1/2</sup>nF F F F F RF F F F F  
 F F F F F F T

" " P "P V'PH P Px " " V x x " "

" x "

1 F F F FzqLoF> RF F RF  
 F R R y T

zqLo F F F F F F  
 F F F F FFB F RFC F F F

F F F Fq<sup>1</sup> L½ dFFNCF F RFNCF F RFNCF

F RFNCF F F RF FNCF F F F

F F p F F F RF F F F

F F F F F RF F F F RF F

F F F F F F F RF F F FSF

F F S F T

n F F F F RF F F F F  
 F F F F F F d

Wv F F  
 Xv F F FLF  
 Ys F FLF

1 F Fz F r w ½ k  
 NrwwkO s Fw F F F F F RFzqLo  
 F F F F kF F½ F Fw Fo  
 N½w QYw½ F F F F F F F FN F

1 F FFB FC F FFB FCFEqlLF F F F F F F  
 F F F F F F F F



CF F dFF F RF F S  
 F TzqLoF F F F U F  
 v F F½ F F½ FN U F CF F Fo  
 £ F F£ TzqLoF F F F F F F  
 F F F F F T  
 1 F Fb]F F N F F CF F F F F F  
 £qLoF F F F F F F F F F  
 TFFp F F F RF F F F F F F F F F F  
 p F F F RF F F F F> F F  
 R F F F F F F T  
 1 F F FzqLoF> F F F d  
 WØ 1 F RF F F F F F e F  
 XO 1 F F F RF F F F  
 F> F F F T F  
 ' F F F F F F RF T  


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 £ F 1 F F F F F F TF¹ RF  
 F F F FFB FC F F Fq Fy F  
 RF F Fq Fy F F F F F£ F Fm  
 m RF F F Fo F ½ T F F F F F½ FnR  
 Fo F RF F 1 1 TF F F Fo F F  
 F F F RF T TF F F F F F F T  


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 1 F F F F F F Fk FXF FzqLoF> F F F  
 1/£x VW S-WFFk F F F F F F F FzqLoF> F/ Fz S dFF¹ n  
 [WVWRE dFVIF½onF> F F F F F F F F T  
 ln F F F Fm FkWF FzqLoF> F F Fz F½on  
 ½ F£ T

1

R F F F F F

F F F F F F F F F F F FXV

F F F F F F F F F F T

<sup>1</sup> F F F F F F F

F F F F F F F F RF F

F F F F F F F F F F F T

k F F RF F F F F F F

F F F T

/ F Fo F F FzqLoF F F F F F

RF F F F HF F F F

F F F F F F F F F F F F F TFF<sup>1</sup> F

F F F F RF F F S F F F F F

F F F F F F F F F F F F T

<sup>1</sup> F F F F S F RF F F F F F F F

T

n F F F F F IR F F N O

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RF F F F F F F F F F

F F F F F F F 1 T  
 F F FzqLoF F F FFBF F FC  
 FB F FC F F F F F F F F F F F F  
 FWFn F F F F F F F F F F F F T o  
 F F F F F F F F F F F F F F  
 TFF<sup>1</sup> F F F F F F F F F F F F F F F F  
 F F F F F F F F F F F F F F F F  
 F F F F F F F F F F F F F F  
 p RF F F RF F F F F F F F F  
 F R S F F F F F F T  
<sup>1</sup> F F F F F F F F F F F F T  
 p F F R F F F F F F F F F N F TO  
<sup>1</sup> F F F F F F F F F F F F  
 F F F F F F F F F F F F F F F F F  
 F F FzqLo RF RF F F F  
 F F F F T  
 p RF F F RF F F F F F F F F F F F F  
 v pF F FmpT<sup>1</sup> F F F F F F F F F F F F  
 F FzqLo> F F F F F F F F F F F Fm  
<sup>1/2</sup> FC FN F FzqLo F F F F F F F F F F F F F F  
 F F F F F F F F F F F F R R  
 F F F F F Tk F F R F F<sup>1/2</sup> FRF F  
 F F F F F F F F F F R  
 F F F F F F F F F F F F F F  
 F F F F F F F F F F F F F R

F RF F F F F F F F F F F  
 F F F F F F F F F T  
 s F F F F F F F F F F  
 RF<sup>1/2</sup> FW F F F F F F  
 F F TFF<sup>1</sup> S F F F  
 S R S R F F TzqLoF F F  
 FB FC F F F F F zqLo T -  
 FB FC F S F F e F F  
 FzqLoF F F F F F F F F RF  
 F F F F FR F F F F T

i i

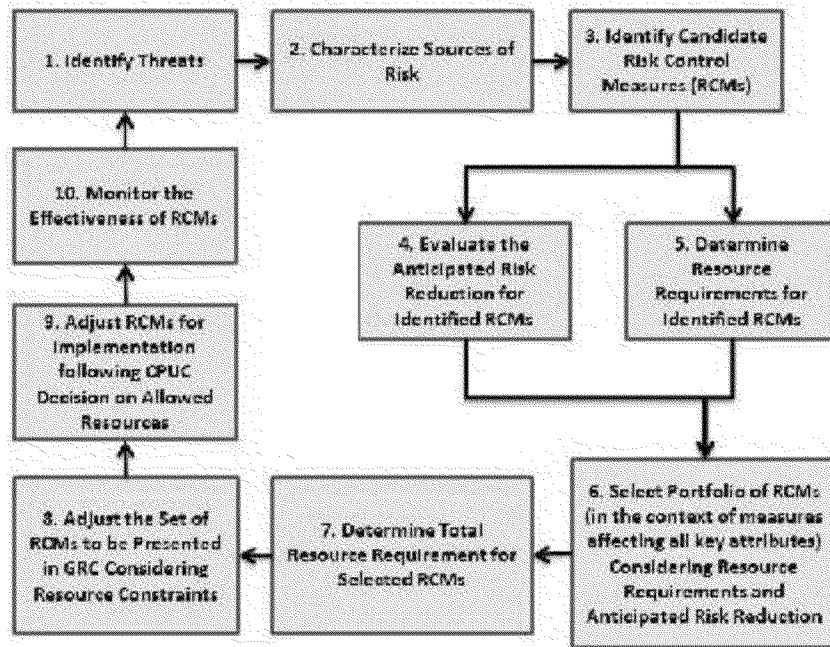
s F<sup>1/2</sup> RW F S F F F F  
 RF F F F F F F F F FW Fa  
 o F F F F F F F F F F F  
 F F RF RF F £ FT F F F F  
 F F F F F F F F<sup>1</sup> F T F F F  
 F F F FW F[c F F Fa aF R F F F F  
 F F FFW FaCF F F F FFW FFaCF F F F  
 a aF U F F F F F F F F F  
 F F F F F F F F F F F  
 F RF F F F F F F F F F F F  
 F T F F F F F F F F F  
 To F F F F F F s FT F F F  
 F F F F zqLoF FFB FFC

m F F F F F F F<sup>1/2</sup> F Ft FYMREXW\T

	F	F	F		F F		F F		F	T <sup>1</sup>	F		F	F
	F		F	F F	<b>K</b>	Fp	Fy	RF	F		F		RF	F
q		F	F <sup>1/2</sup>		Fm		F F	F	F			FF	F	
	F		F	F	R	F	F					RF	F	F
	RF			F	RF	F	T <sup>1</sup>	F	F	F <sup>1/2</sup>		FW	F	F
	F		F	F	RF		F F	F	F	H			RF	
zqLoF		F	F	F	F F		F		F	T				
	y	F	F <sup>1/2</sup>		FW	F	F <del>B</del>	<del>FRF</del>	F	S	F			F
		F	F	F	F	F	F	F	F	F	F		F	F
			F	F <sup>1/2</sup>	FXF	F	F F	F	RF		F	F	F	
		EqLoF			F	F	F	F	F	F	1/2		FW	
1/2		FXT												
	1	F		F			F			RF	F		RF	
		RF	F	F	F		F	FzqLoF	F F		F F	F	F F	
F		F		F F	F F	F	F F	F	Fq <sup>1</sup> L <sup>1/2</sup>		T			

1/0nF> F FzqLoF> Fq<sup>1</sup> k/2 F  
 F Fm Fm F F F FzqLoF  
 F RFkTVWVWcTFF<sup>1</sup> F F F F F SF FVW RF  
 F T

**Elements of a Risk-Informed Rate Case Development Process**



W s F F F F F F F F F e  
 X O m F F F F e  
 Y O m F F F F F F F e  
 [ O m F F F F F F F F F  
 ] O z F F F F F F F F F F  
 F e

\_O ½ F£nw F F F F F FN F F  
 F F F F F F F£nw Qe  
 aOn F F F F F F F F£nw e  
 bOk F F F F F£nw F HF F3 F F F  
 F F F F F F F F F e  
 cOn F F F Fq F£ Fm F RF F F Fnz/nF  
 F F F F RF RF F Fnz/nF RF F  
 F> F e  
 WQw F F F F F F£nw F RF F F  
 RF F F F T

' F F F F F EzqLoF>  
 F F F F F F F F F  
 TFk F RF F F F F F F F  
 q¹ L½ T¹ F F F F F F F  
 F F F RF F F FF F F F> F T  
 s F F F F FzqLoF F F S F F F F F F  
 F F F F T

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kT p F F F  
 lT ½ F F F F F F F F F  
 F F F F F F F F F F F  
 nT z F F F F F F F F F F F  
 F F F  
 nT p F F F F F

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W  P P P P P P P P P P

i i i i i  
 ¹ F F F F FzqLoF F F F F  
 F F F F> F F Fk½wFl YWb½F S F F  
 F F T

1 F F F F F F F F F F  
 F F zqLoF> F F F b]F F N  
 F O F F F F F F F F a k FT F F  
 F F F F F F F F FRF  
 F SW\_XF F RF F RF F RF F 1 RF T  
 F F F RF F F F F F F  
 F F F F F F m T F F F F  
 F F F F F F F F FzqLoF F  
 F TF FzqLoF F F F F F F F  
 F F STF F F F F RF F F FN F F  
 CF F F F F F F F F S T  
**ie z P P P P**

*i r i s*  
 p F F zqLoF F F F F F F F F  
 F TF F F F F F FzqLoF> F F F  
 F F F F F F F  
 T  
 p F F F RF F F F F F F FzqLoF  
 RF F F RF F F F F F  
 F F F F TFFp F F F F F  
 F> F F F RF F F F F F 1 F T F  
 F F F F F F F F F F F F>  
 F F F F F RF F F F F F F R  
 F F T

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zqLo F> F FB F FC F F F F F F

T



<sup>1</sup> F F FzqLo F F F  
F F F F F F Ts F F F  
F F RF F F F F F F  
RF F F F F T  
<sup>1</sup> F F F F F F F F F F  
F F F F F F F F  
FN F F F F F RF F F  
CF F F F RF F F F F F  
F F T<sup>1</sup> F F F F zqLoF> F RF F  
F F F F <sup>1</sup>T F F F F F F F F  
F S F F F F F F T  
q F F F F FNswzO  
F FzqLoF F F F RF F F F F  
F F F F F F N F F  
F RF F RF F RF F TO F  
F F F F F F F F F F F  
F F <sup>1</sup>T F F F F F F F F  
F F F F F F F k T  
<sup>1</sup>swzF F F F F F F F F F R  
F F F F F F F  
F F F F F F F F F T  
k FzqLoF> F F F F F F F F  
RF F F F F F F F F F  
F F F F F F F F F F  
T

je	P		P		P		P		PX z		Y		
	<i>i</i>		<i>rii</i>		<i>i</i>		<i>is</i>						
1	F	F	F	F	F	F	F	F	F	F	F	F	F
	F	F	F	F	F	F	F	F	F	F	F	F	
	F	F	F	F	F	F	F	F	F	F	F	F	TFF'
zqLoF	F		F	F	F	F	F	F	RF	F	F	F	F
	F	FzqLoF	F	F	F	F	F	F	F	F	F	F	
		F	F	F	F	F	F	F	F	F	F	F	T FzqLo
p	F		RF	F	F	F	F'	Fs	Fw	Fz	RF	F	F
	F	F	F	F	F	F	F	F	F	F	F	F	F
	F	F	F	F	F	F	F	F	TFFp	F	Fq	F <sup>1</sup>	F <sup>1/2</sup>
y	F	Fw	Fz	RFzqLoF	F	F	F	F	F	F	F	F	
	F		F	F	F	F	F	F	F	F	F	F	F
	F	F	F	TFFzqLoF	F	F	F	F	F	F	F	FFB ...	F
	F	F	F	F	F	F	F	F	F	FC	TFFr	RFzqLoF	F
	F	F	F	F	F	F	FFB	FC	F	F	F	FRF	F
F	F	F	RF	TF <sup>1/2</sup>	RFzqLoF	F	F	F	F	F	F	F	F
	F	F	F	Fv	Fw	Fz	RF	F	IF	F	F	F	
	F	F	F	F	F	F	F	F	RF	F	F	F	
F		RF	TFF <sup>1</sup>	F	F	F	F	F	F	F	F	F	FzqLoF>
	F	F	F	F	F	F	F	F	EqLoF	TF	F	F	
F	F	F	F	F	F	F	F	F	F	F	F	F	
	F	RF	F	R	F	T							
zqLoF	F	F	F	F	F	F	F	F	F	F	F	F	
	F	F	F	F	F	RF	F	F	F	F	T		

ke z	P	P	P	P	P	P	P	PX z	Y
	<i>i</i>	<i>rii</i>	<i>i</i>	<i>i</i>	<i>i</i>	<i>i</i>	<i>i</i>	<i>si</i>	
zqLoF			F	F	F	F	F	F	F
F	F	F	F	F	TFFs	F	F	F	F
F	F	F	F	F	RFzqLoF	F	F	F	F
F	F	F	rT	R	F	F	zqLoF	F	F
F	F	F	F	F	F	F	F	F	F
F	F	F	F	TFF <sup>1</sup>	F	F	F	F	F
F	F	F	F	F	F	F	TFFzqLoF>	F	F
F	F	F	F	F	F	F	F	F	F
F	F	F	F	F	F	F	TFFzqLoF	F	F
F	F	F	F	F	F	F	F	F	F
F	T								

le'	P	P	P	P z
	<i>i</i>	<i>rii</i>	<i>i</i>	<i>is</i>
<sup>1</sup> F	F	F	F	F
F	F <sup>1/2</sup>	FW	FXF	F
F	F	U	F	F
RFzqLoF	F	F	R	R
F	F	F	F	F
F	rT	R	F	F
F	RF	RF	F	F
F	F	F	F	F
F	F	TzqLoF	F	F
F	F	F	F	F
T				

p F RF F F F F Fo Fp Fm Fz  
 F Fq S F<sup>1</sup> Fs F Fw Fz F F  
 F F F TFFs F F RFzqLoF F F F F  
 F F F F F F TFF<sup>1</sup> S Fq F<sup>1</sup>  
 F Fw Fz F F F F F<sup>2</sup> Fz  
 £ F <sup>b</sup>RF F F F F F F T  
 zqLoF <sup>c</sup> F Fq S F<sup>1</sup> Fs F Fw  
 z F F F<sup>2</sup> Fz F£ Fz F FFB F  
 F C z q Lo F F F F F F F F F F F T  
 k FzqLoF <sup>w</sup> F F FFB F C F F F F F F  
 R<sup>1</sup>/<sub>on</sub>F F F F F F F F F F  
 F F F RF F F F F F F T  
 zqLoF F F F F F F F F F F  
 F F F F F F F F F F FzqLoF>  
 F TFFs F F F F F F F F F FzqLoF>  
 FN F<sup>1</sup> RF<sup>2</sup> Fz F£ CF F F F  
 F F F F F F F F F F F F T

**ne**     P z P P        P        P P        PX P P

          P P P        P P        P z Y

i ii ir i i i i i si  
 zqLoF F F F F F F F F F F F  
 F F F F F F F F F T

<sup>b</sup> 1/2 FzqLoF<sup>1</sup> RF F[kS] cT

<sup>c</sup> 1/2 FzqLoFm F F<sup>1</sup>/<sub>on</sub>Fz F£ RF TFWR Fm FkY\_T

<sup>w</sup> 1/2 FzqLoFm F F<sup>1</sup>/<sub>on</sub>Fz F£ RF TFWR Fm FkY\_T



F F RF F F F F F F F  
 F F F F d  
 l F F F F F F F  
 F F F F F F F F F F  
 F F F F F F F F F F F F  
 F F F F F F F F F F F F  
 F F F F F F F F F T  
  
 zqLoF F F F F F F F F F F  
 F FFB F F F F FC F F FFB F F FC F TFFs  
 F<sup>2</sup> Fz F£ Fz RFzqLoF F FFB XF F F  
 F F F F F F F F F F F FL  
 F F F F F F FcVF F F F F F F F  
<sup>w</sup>IFC FFr RF F F F F F F FzqLoF> F F  
 F F F F F F F F F F F F  
 F F F F F F F F F T  
 ½ RF F F F F F F F F  
 F F F F F F Fn Fk TFFs F F F  
 zqLoF> F F F F F F F F F F  
 zqLoF F F F T  
 ‘ F Fz F Fo Fs Fw RFzqLoF F  
 F F F F F F F TFFzqLo  
 FFB F F£nkF.N£ Fm Fk OF F F F F F F  
 F F F F F F F F <sup>w</sup>FC FFr RF F F  
 F F F FFB F F FC F FFF F F

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<sup>w</sup>zqLoF<sup>1</sup> RFz F[k S ]  
<sup>w</sup>zqLoF<sup>1</sup> RFz F[k S ]

F F F F F F F F TFF½ RF F  
 F F£ Fk Fz Fs RFzqLoF F FFB ... F F  
 F F F F F F FLF F FF WFC  
 F F F F F F F F F T  
 s F RF F F F F F F F F S F  
 F F F F F F F F F F sF T  
 F FzqLo F F F F F FFB F F FC F F R  
 F F F F F F F F F  
**ne ' P P P P P P P z**

*i r i s*  
 y RF FzqLoF F F F F F F F F  
 TFF¹ F F F F F F F  
 F F F F F F F S F  
 F F F F F F F F F F F F  
 TzqLoF F F F F F F F  
 ½ FW F XRF F F F F F F F  
 F F F F F Tk F F F F F  
 F F RF F F F F F F F F F  
 F F F F F F F T

**oe x P P P P z P P P P P P P**

*i r i s*  
 s F RqLo F F F F F F  
 F F TFFr RF F S F F

w zqLoF¹ RFz F[k S\_T

F F F RF F F F F RF RF  
 F F F F F F F F F F F F  
 F F F F F F F F F F  
 F RF F F F F F F F F  
 F R F F RF F F FR F  
 F F F F F F F F T  
 k RF F RFzqLo F F F F  
 F F F F F F F F F F  
 T  
 ½ FcF FWF F F F F F F F F eF F  
 F FzqLoF F Snz/nF T  


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 i i  
 l F F F F F FzqLoF> Fq<sup>1</sup> L<sup>1</sup>/F RF<sup>1</sup>/onF F  
 F F F F FzqLoF> F F F  
 F F T  
 WT P P P P P P P  
 P e<sup>1</sup> F F FB F F FC F F F  
 F F THF F R F F F F F F F F F  
 F F F R F F F F F F F  
 F F F F THF<sup>1</sup> F F F F F F  
 F F F F F o TF F F F F F RF  
 F F F F F F F F F  
 F F T  
 XT x P P P P P P le F  
 F F F F F F F



F F F R F F F F  
 F F R F RF  
 F F F F F F RF F F  
 F F RF F F RF F FRF  
 F F R F F Ty F F F F F  
 F F F F RF F F F F F  
 F ~~Ron~~F F F F FN F F O  
 F F F F F F F F F F F F F  
 F F Ts F F F F F  
 F F F F F F F F F F F  
 N F F O F F kT F F  
 F F F F F F F F F F F F  
 TFF<sup>1</sup> F F F F F F F F  
 F F F F F F F F F F F  
 T F F F F F FzqLoF F HFB F  
 FC F F F F F F S  
 F e ~~Ron~~ F F F  
 F T  
**YT P P P P P P P P P P P P**  
**P P P P P PhP PiP P e**  
 n F F F F F F F F F F F  
 RF F FzqLoF F F F F F F F  
 £ F F F F F F F F F F F F  
 F F F F F F W' TF F F F  
 FzqLoF F F F F F F F

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<sup>wz</sup> F F F F F F F F F F F F F F  
 n Fo RFsl wFt F F£ F Fn RF<sup>2</sup> TF][Fx TFYFz FXFw Ut FXWWT Fr F

F F F F F F F F F F F F F  
 TFF' F F F F FzqLoF F F F F F  
 S F F F F F F F F F F  
 F F S F F T  
 [T V'P P P P P P P P P P  
 P f P es F F F F F F F  
 F F F F RFzqLoF F F F  
 F F F F F F F TFF<sup>1</sup> F F  
 F F F F F F F RFzqLoF  
 F F F F F F F F  
 F T  
 ]T P P P P P P P P  
 P P P en F F F  
 F F F F F F F F F  
 F F zqLoF F 1/2onF F F  
 F F F F F F F F F  
 F F F F RF F F F F F  
 F F F F F F F F F  
 F Ts F BqLoF F F F F  
 F F F F F F F' F T F F  
 F F F dFzqLoF F F F F  
 F F F F F FN F F F  
 F F OFI F F zqLoF F F F  
 F F F F F F F F F F F  
 £ w z FNEvzCSW<sup>w</sup>TFFzqLoF F F

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q<sup>1</sup>½£ m FXWY n£ y£k Vaa~[k Whyxp T

F F F F F F F F  
 F F F T  
**ne** P P P e zqLoF F F F F  
 F F F F F RF F F F F F F  
 F F F<sup>1</sup>on T<sup>1</sup> zqLo F<sup>1</sup>on F F  
 F F F F F F F F F  
 RF F RF F F F F F RF F  
 F F F F F TF~ F F F  
 F FB F FC F F F TF F F  
 F F F F F FN O F  
 F F F RF F F F F F F F  
 F F FzqLoF F F F F F F F F  
 k Fv Fk F£ z Nkvk£zO<sup>16</sup> F  
 F F F F F F T'  
 FzqLoF F F F F F F F F TF F F  
 kvk£zF F F F F Fm RFzqLoF F F F  
 F F F F F sTF F F F F F F F  
 kvk£zF F F F F F F F  
 F F F F F F F F F  
 F F RF F F F F F F  
 kvk£zRF F RF F F F F F FFB  
 TF~~RF~~ F F F F F F F F FN  
 O F F F F F F F F F  
 F F F F F F F F F TFF<sup>1</sup> F

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<sup>w</sup>z F<sup>1</sup> RFz~~TS~~T  
 ½ Fk F F F F F F Fkvk£zT

F F F F F F F F F F F F RF  
 RF FF F F F<sup>w</sup>T F F F F F  
 F F F F F F F F F F F F  
 F F TFFp RF F F F F F F F F  
 F F F F F FF F U F F F F  
 Ukvk£zT  
**ne** P P P P P P P  
 ezqLoF F F F F F F F F F F  
 F F F F F F TF' F F  
 F F F RF F F F F FzqLo F  
 F F F F F TF<sup>1</sup> F F F  
 F F F F F F F F F F  
 T

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p F F F F F F F RF F F F F F F F F F  
 F F F F F F F F F F F F F F F F F

“z “ ’x P P Px “ “ Px ’P

x x “ “

W zqLoF F F F F F F F F F F F F  
 F F F F F F F F F F F F  
 TFFk F F RFzqLoF F F F F F F  
 F F F F F F F F F F F F  
 F F F T  
 XI zqLoF F F F F F F F F F F F F  
 F F F FF F F F F F F F F  
 TFFzqLoF F F F F RF  
 F RF F F F F SF F F F F R  
 F F F F F F F F F F F F T  
 YT zqLoF F F F F F F F F  
 F F F F F F RF RF  
 F RF F RF F F FTFF<sup>1</sup> F F F  
 F F F F F F F F F F F F  
 F F F F F F F F F F F F F F  
 F F F F F F F F T  
 [ T zqLoF F F F F F F FB Fv Fk F£  
 z FC F F F F F FzqLoF F F  
 F F F F F F F T  
 ] T zqLoF F F F F F F F F  
 F F½ FbR FWF F½ FXF F F F F  
 F F F F F F F R F F

		F		F		F			TFk				F	
	F		F	F	F $\frac{1}{2}$	FnF		F	F	F $\frac{1}{2}$		F <del>W</del>	F <del>X</del> F	
	F	F		T										
_T zqLoF		F		F		F		F	F	F		F	F	
		F	F	F	F	F		F		F	F	F	F	
		F		F		T								
aT zqLo			F		F	F		F	F		F	F	F	F $\frac{1}{2}$ on
	RF		F		F		F	F	F	F	F	F	F	
		F		T										

“ x                      Py “    “ “ P   V P “    “   Px ’                      “

s F                      F F F                      F                      F FzqLoF> F                      F                      F F F                      F F  
 l RF Fnz/nF F Fm                      Fv                      F                      F                      F                      F  
                     F                      F                      F                      F F Fp                      F                      F                      F                      F  
 F Fm F Fp                      F£                      FNp£CRF<sup>1</sup>                      F[cRFz                      FWVF                      FWcTFk                      F F  
                     F F                      F                      F                      F F F                      F                      F                      F                      F  
 F                      <sup>1</sup>T F                      F                      F                      F F                      F                      F F                      F  
                     F F                      F                      F                      F F F                      F F F                      F F  
                     F                      F FzqLoTF<sup>1</sup>onF                      F F F                      Fk                      FzqLo  
                     F F F                      F F                      F F F                      F                      F                      F<sup>xv</sup>                      T  
 k F                      F F                      <sup>xv</sup> F                      F F<sup>1</sup>onF>                      F<sup>1</sup>/<sub>2</sub>                      F£                      F£                      F F  
 z F<sup>1</sup>/<sub>2</sub>                      Fo                      Fz E/                      Fk                      FN<sup>1</sup>/<sub>2</sub>ozE/                      <sup>xv</sup>RFzqLoF; q<sup>1</sup>L<sup>1</sup>/<sub>2</sub>  
 k                      F                      F F                      S                      F                      F F                      F                      F  
 F                      F                      F                      F F                      F                      F                      F F  
 F                      F                      F                      Fz<sup>1</sup>/<sub>2</sub>ozF FXW~~X~~IFzqLoF                      F                      F                      F  
 F                      F F                      F F F                      RF TzqLo                      F F                      Fz<sup>1</sup>/<sub>2</sub>oz  
 F                      F F F                      T<sup>v</sup>zqLoF                      F F                      F  
 F                      Fz<sup>1</sup>/<sub>2</sub>oz                      F T

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£                      F                      FnkFz                      E/                      Fm F<sup>1</sup>/<sub>2</sub>                      Fc]bF                      F~~S~~~~V~~~~W~~~~T~~  
<sup>xw1</sup>                      F TFS~~W~~RF T~~S~~X RF                      Fm                      F[kT  
<sup>xx</sup>KTWS~~S~~W~~S~~ Sz                      F<sup>1</sup>/<sub>2</sub>                      Fo                      Fz                      FN<sup>1</sup>/<sub>2</sub>ozCF/                      F                      F Fy                      FXcRF~~X~~W~~V~~IF<sup>1</sup>onF>  
 £ F F                      F F F                      F F Fk                      FX]RFXW~~V~~T  
<sup>xy</sup>m                      F yLwFo                      F                      F F Fq F<sup>1</sup>                      F F<sup>1</sup>/<sub>2</sub>                      F£                      Fm T

k F F Fn FN~~WSV\_SW~~F F F Fn~~WSV\_VRF~~  
<sup>x</sup> z<sup>1/2</sup>ozF FzqLoF> F F F F F Fz/ nF>  
 F F Fm F F F F F F F F F F  
 F F F F F T  
 s F F F FzqLoF> F F F F F F  
 nz/ nF> F F F<sup>1/2</sup> F Fm <sup>x</sup> F> F F F F F F  
 RF<sup>1/2</sup>onF F Fr F<sup>1</sup> F F<sup>2</sup> Fz F£  
 z <sup>x</sup> F F q<sup>1</sup>L<sup>1/2</sup> F zqLoF>  
 F F F Fz<sup>1/2</sup>ozTFk F Fz<sup>1/2</sup>ozF F SF  
 F F F F F R F F F F  
 F dF F F F F F F nz/ nF>  
<sup>1/2</sup> F Fm F> FF F F F F F F F F TFs  
 F F RF<sup>1/2</sup>onF F F F Fz<sup>1/2</sup>ozRF F  
 nz/ nF RF F F F F Fz<sup>1/2</sup>ozF F RF  
 F Fz<sup>1/2</sup>ozRF F F F RF F F  
 F F F F TFs F F F F F F F F F  
 F F F F F Fz<sup>1/2</sup>ozF TF£ RF F F  
 F F F F F F F F F F F F  
 F F T

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m Fz E/ Fm FN~~z~~/ Fm CF<sup>1/2</sup> Fc] bF F  
 FB F F F F FC F F F F F F

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<sup>x</sup> p F Fk FX\_RFX~~WVR~~  
<sup>x</sup> p Fn~~WSV\_SW~~F F F F F F F Fm Fv  
 F F F F<sup>1/2</sup> Fc] bF F Fz E/ Fm T  
<sup>x</sup> m [kF F F<sup>1</sup> TF<sup>1</sup> F F F F F F F F  
 F F F SXWYT



F F F F F F F F F F F F F F  
 F F F F F TFC Fk F F F F F F R  
 FB Fm F F F F F F F F FFLW F  
 F FeFXCF F RF F F F FLFC

s nIVSW\_SWR Fmz/m F F F F d

□ m F F F F F SF F F  
 F F F F F[cFm F Fp F£ FNpEO  
 WXT\_WRF F[cFmpFWXT\_WFN OT

□ s F F F F F F F F F F F F F F  
 F F F F F Fw Fk Fy Fz RF  
 YKF½ Fw F" F½ T

□ ½ F F F F F F F F F F  
 F F F T

□ m F F S F F F F F F F F  
 F F F Fw Fk Fy Fz F T

□ m F F F F F \$ HF F F F  
 T

□ s F F F F F F F F F Fz F T  
 □ £ F F F F F F F F F

1 F F F F F F F RzqLoF F  
 F F F F F F F F F F  
 F F F F TFzqLoF> F F FF F F  
 F F F F F F Fk½wFl YWb½F F F  
 d

W w F  
 X p F F F  
 Y m F F F F F

<sup>1</sup> Fz<sup>1</sup>/<sub>oz</sub>FFB z Fw Fn F<sup>1</sup> F<sup>1</sup> O  
 F F F R F F F F RF F  
 F F F RF F F F zqLoF F F  
 nz/nF F F F F F F F Fz FWF Fz FXF F Fz<sup>1</sup>/<sub>oz</sub>F  
 F F F Fz FVRF F FFB z FXF F F F F  
 F F F F F F Ft FVRFXWYRFC F F F  
 F F Fk <sup>1</sup> T nz/m F Fz<sup>1</sup>/<sub>oz</sub>F F  
 nTWSSWVF F FzqLoF F F F F F F  
 F F F k H F RFkTSSWV Fz<sup>1</sup>/<sub>oz</sub>F T  
 k Fz<sup>1</sup>/<sub>oz</sub>F F F F FXWRFz FWF F F  
 XWVF F F F F F F F FXWYTFn F F FzqLoF F  
 F F d  
 W<sup>1</sup>/<sub>2</sub> F F F F FNn FYRF[ F F Fr  
 m Fk FNnkCFRF F F F F F<sup>1</sup>/<sub>2</sub> Fw  
 " F<sup>1</sup>/<sub>2</sub> FN<sup>1</sup>/<sub>w</sub><sup>1</sup>/<sub>CF</sub> FYVF F F RF F F F  
 U F U F U F F eF U  
 XO<sup>1</sup>/<sub>2</sub> F F F F F F F F F  
 F T  
 k F t FYRFXWYRFzqLoF F F baT<sub>-</sub> <sup>xb</sup> F F  
 F F F ]\_\_ F F F Fz<sup>1</sup>/<sub>oz</sub>TFr <sup>1</sup>/<sub>bn</sub> F  
 F F Fz<sup>1</sup>/<sub>oz</sub>E/ RF F F F F F F F  
 z WF F F F F F F F Fz FWF<sup>1</sup> F  
 F F Fz FW  
 zqLo F F F F F F F F  
 F F Fz<sup>1</sup>/<sub>oz</sub>Fz FWF F SXWVF F F XWYFq<sup>1</sup> L<sup>1</sup>/<sub>2</sub>

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<sup>xa</sup> k FnRFnTWSWVF  
<sup>1</sup> F F FWTF F F F F FbTaF F F F  
 F Fz<sup>1</sup>/<sub>oz</sub>T

TF' F F Fz FXF TFzqLo  
 F F FWRJ WF F F F F F F  
 T' F Fm F[kF T  


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*o i i i*  
 n FzqLoF> F F F F F F F F Fq<sup>1</sup> L F  
 F Fz<sup>1</sup>/ozF F F F F F F F F Fz FXF  
 z<sup>1</sup>/ozR zqLoF> F F F F F F F F F F  
 F F F Fz<sup>1</sup>/ozT F F F RF T  
 P " P Py P P e<sup>1</sup> F F F F F  
 F Fz<sup>1</sup>/ozF FzqLoF> F F F F Fz<sup>1</sup>/ozF F F  
 F Tp F F FzqLoF R/onF RF  
 F RFzqLoF F F F F Fz<sup>1</sup>/ozF F R  
 F F F F F F F F F F F  
 TFFzqLoF F F F F F F F F F  
 T<sup>c</sup> zqLoF F F F F F F  
 F RF F FF F F F RF F F  
 F <sup>1</sup>/oif F F F F FzqLoF F F F F  
 F F F F F F F F F F F TF<sup>1</sup>/<sub>2</sub>  
 F F F FF F RF S F F F F F  
 F F F TFp F RF F F F  
 F F F F F[cFn<sub>p</sub>LFz FWXRF<sup>1</sup>/<sub>2</sub> FyRF F S  
 F FNn F F F FCRF F F F F F  
 S<sub>rnk</sub>F FN F F F F F  
 rnkF> OFs F F F F F F F F F F F  


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 x 1 F TcSWF F F F F F F F F R  
 F RF F T

TzqLo            F   F F            F   F                    F   F  
           F            F   F S            F            F            F            F F  
           F            T  
           **P    P P            P            ek    F            F            EzqLoF>**  
 F F F            F   F F F            F            F F            F F½    F>  
 F            F            TFzqLoF    F            F    F F            F  
           F            F F F            F            F            TFk F F  
           F    FzqLoF            F            F    F F            F FXXQT  
           **P            P P            P            P Px            P            P**  
           **e**<sup>1</sup> Fr            F<sup>1</sup>            Fz            F    F    F    F            F    F  
 F F            F            F F    F    F            F            F F            F F            F  
 F            F            F            TF<sup>1</sup> F            F    F FWF            F F            F F  
 F F F    F F F            F Fz½ozF    F Fq<sup>1</sup>L½F    F    F            F F F  
 F    F F    Fz½ozF    F    F    F            F            F            F            F  
           F            TF<sup>1</sup>    F            F            F    F            F F F    F    F  
 F            F            F            F F            F F½    F>    F            F            F    T  
 x                            z    f                            z            ezqLoF    F F    F  
 F Fk            Fy            Fm    U    Fy            Fm    FNkynU ynCF    F  
           F    TF<sup>1</sup>    F            F F F    F    F            F            F            FNzsfCF  
           F F            F F            F F            F F F            F F            F    F  
 TzqLoF            F            F            F            RF            F F            F            R  
           F            F F    FkynU ynF            TV  
           **P            P            P P            P            P P            P            PzqLoē    F            F**  
 F F            F    F F            F F            F            F    Fi    i    i    i            T

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<sup>w½on</sup>F    F    F            F F            F    F            F    F F    F    F            F F F    T F



F F F p F FXW~~W~~F RF F F  
 F F F Frnk F F S~~nk~~F FYF F[F  
 F F F FXVF F~~W~~<sup>1/2</sup>TFk F F FN F F O  
 F F F F F F F F F F F F  
 F F F F F F F F F F F F TFk  
 F F RF T TF S~~nk~~F F F F F FX  
 N CF F F S~~nk~~F F F FXVF F~~W~~<sup>1/2</sup>F F F  
 F F FXW~~W~~T  
 P P P P e<sup>1</sup> F F F F F F  
 F F F F F F F F F F F F  
 F F F F F F F F<sup>1/2</sup> ~~F~~ T  
 zqLoF F F RF F F F F F F F F F  
 F F F> F<sup>1/2</sup> FtF RF F F F F F F F F F  
 F F F F F F F F F F F F F F F F F  
 F F T  
 ' F F F F F F F F RF R TF  
 F F F F F RF F F F F F F F F F F  
 F F F F Tk F Fz<sup>1/2</sup>ozFn F<sup>1</sup> F F F  
 F F F F F F F F<sup>1/2</sup> FtF F F F RF  
 F F F F F F F F F F F dF FVO  
 1 F Fz<sup>1/2</sup>ozF F FXCF<sup>1</sup> F Fm F F F TF<sup>1</sup> FF B <sup>1/2</sup>ozFC F Fz  
 F F F<sup>1/2</sup> FtF F F F S~~W~~<sup>a</sup>V> F RF F  
 F F F F TFp F FF F F RF F F  
 F F F F F F RF F F  
 F S F F F RF F F  
 F F F F RF F F F F F

F TFzqLoF F F F F F FF F F  
 F F F RF F y Fz FYF nTWS\_S  
 WXd  
 kF F F F F F F F F F F  
 F F F F F F F TFFp F F  
 F F F F F F Fq Fy FWXRF F F F  
 F F F F F F T  
 z<sup>1</sup>ozF F F F F F F F F F F F F  
 RF RF F FN<sup>2</sup>nCRF F IF F F F F  
 F TF<sup>12</sup>nF F F F F TFs FzqLoF F  
 F F F F F F F F<sup>12</sup>nF F RF F F F  
 F F F TFr RF F F F F F  
 F F F F RF F F F RF F S F F  
 T  
 zqLoF F F F F F F F FB F<sup>xy</sup> F HC F F  
 F F F F F F TKF F F F F  
 F F F F F F F F F F F  
 F F F F F<sup>1</sup>orT F> F F F EXW  
 F FrnkF> F F F F F F F F F F F F  
 XWYRF F F S<sup>nk</sup>F F F F F F F F F F F F  
 F F F FW FXF F F R  
 F F T  
 z P' Px &F F F F F F F  
 F F F F F F F F F s IF FT  
 F F \$ F F F FrnkF RF F F F F F F F

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<sup>xy</sup>zqLo<sup>1</sup> F T|kSbT

F F TFr RF F F F F F F F F F F  
 FB F F FC F F F F F FR F F F F  
 F F F RF F FzqLoF F F F F T  
 n F F F F F F RF F F RF  
 F F F TFzqLoF F F F RF RF  
 F RF F F Fz/nF F T

$\frac{i \quad i \quad i}{\quad}$

1 F<sup>2</sup> Fz F£ Fz RF F Fm F[kF F  
 RF F F F F F F F F F  
 F F F F F F F F F F F F  
 U F F F F F TF<sup>1</sup> F  
 F F F F F F F F d

- ' F
- w Um F
- w F
- y F S F F F F
- m F
- l F F
- k F F F

k F Fz<sup>1/2</sup>RF F F F F F F F F  
 F F F F S F F TFz F F F F F  
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<sup>u</sup> £TWSXSWRFz<sup>1/2</sup>ozFs Fz RF<sup>1</sup> F SFY  
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<sup>u</sup> zqLoF<sup>1</sup> F TFXMYT

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	RF <sup>1/2</sup>	onF	F	F		F	FzqLoF	FJ bTW		F	F		FzqLoF	F	
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	yb k	Ff	FwRFwRFpXRFpYRF	FnxF	F	Fz <sup>1</sup> ozFn	F <sup>1</sup>	T			
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F	T										
	lvk	F	FzozFn	F <sup>1</sup>	F	FzqLoF	IF	F	F		
	F	F	F	U	F	RF	F F F	F	FYF	F <sup>1</sup> w <sup>1</sup> /R	
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           F            TF<sup>1</sup> F F            F            F F F            F F F            F F F F  
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- Effectiveness – In the evaluation criteria the term “effectiveness” as applied to a risk control measure (RCM) is used to mean the extent to which use of the RCM contributes to reducing pipeline risk.
- Industry Best Practices - Industry Best Practices can be defined as that set of practices, beyond minimal safety regulations, that have been demonstrated in practice to produce superior safety results.
- Risk characterization – A process involving development of sufficient information at the segment level on the sources contributing to the probability and potential consequences of events affecting risk to inform risk management decisions.
- Threats – Phenomena (e.g., corrosion, embrittlement) or occurrences (e.g., excavation damage, seismic events, auto collision with meter sets, operator error) which alone or in combination have the potential to give rise to or contribute to risk.

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- Risk: The effect of uncertainty on objectives; often expressed in terms of a combination of the likelihood of occurrence of an event and associated event consequences (Definition from ISO Guide 73:2009)
- Likelihood: The frequency of an event leading to adverse consequences (Definition derived from ISO Guide 73:2009)
- Consequence: The impact or outcome of an event affecting objectives; often expressed in terms of human health and safety impacts, economic damage, and/or environmental damage (Definition derived from ISO Guide 73:2009)
- Risk Assessment: The overall process of risk identification, risk analysis, and risk evaluation (Definition from ISO Guide 73:2009)
- Risk Identification: The process of finding, recognizing and describing risks (Definition from ISO Guide 73:2009)
- Risk Analysis: Process to comprehend the nature of risk and to determine the level of risk (Definition from ISO Guide 73:2009)
- Risk Evaluation: Process of examining the results of risk analysis to determine whether the risk and/or its magnitude is acceptable or tolerable (Definition derived from ISO Guide 73:2009)
- Risk Management: Coordinated activities, beginning with risk assessment, to inform and implement decisions designed to direct and control an organization with regard to risk (Definition derived from ISO Guide 73:2009)

- *Risk Management Process*: Systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context, and identifying, analyzing, evaluating, treating, monitoring and reviewing risk (Definition from ISO Guide 73:2009)
- *Risk Treatment*: Process to modify risk; can involve removing the risk source, changing the likelihood, or changing the consequences (Definition derived from ISO Guide 73:2009)
- *Monitoring and Review*: Process of continually observing risk status to identify change from the expected performance level, and to determine the effectiveness of the treatment of risk (Definition derived from ISO Guide 73:2009)
- *Risk Register*: Record of information about identified risks (Definition from ISO Guide 73:2009)
- *Residual Risk*: Risk remaining after risk treatment (Definition from ISO Guide 73:2009)

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x ZX

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