



Automated Cost Estimating Integrated Tools

# Incorporating Funding Considerations into your Cost Risk Assessment

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# Setting the Table

- **In most cases, a cost risk analysis is performed prior to (and sometimes independent of) a schedule risk analysis**
- **Comparing the risk adjusted time-phased estimate against the total budget will give an indication of shortfalls and rollover of effort into ensuing years**
- **This presentation demonstrates a methodology to estimate the potential schedule slip and resulting time-phased results due to annual budgetary shortfalls through the use of annual risk statistics and annual budget values**



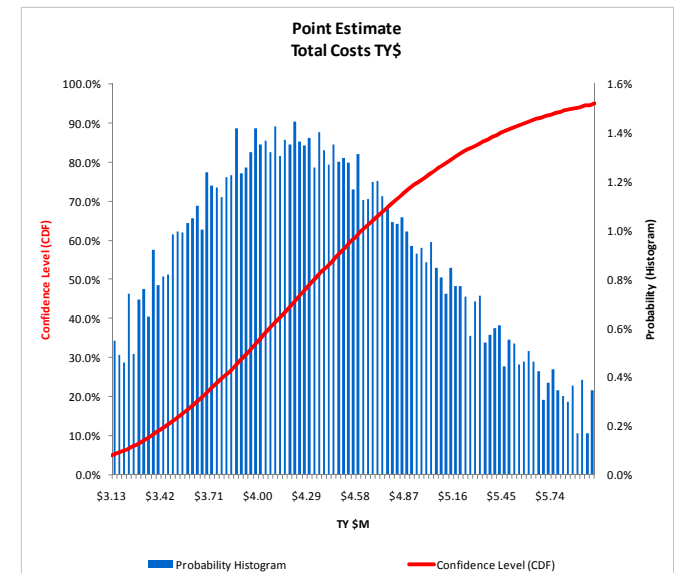
# Model Example

## ■ Phased budget and point estimate

TY\$M	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Total
<b>Budget</b>	\$0.13	\$0.38	\$0.57	\$0.68	\$0.71	\$0.62	\$0.45	\$0.20	<b>\$3.74</b>
<b>Cost</b>	\$0.12	\$0.36	\$0.55	\$0.66	\$0.68	\$0.60	\$0.41	\$0.15	<b>\$3.54</b>

## ■ Cost risk and uncertainty statistics

Point Estimate	Confidence Level	Mean	Standard Deviation	CV
\$3.54	15%	\$4.42	\$0.88	0.20



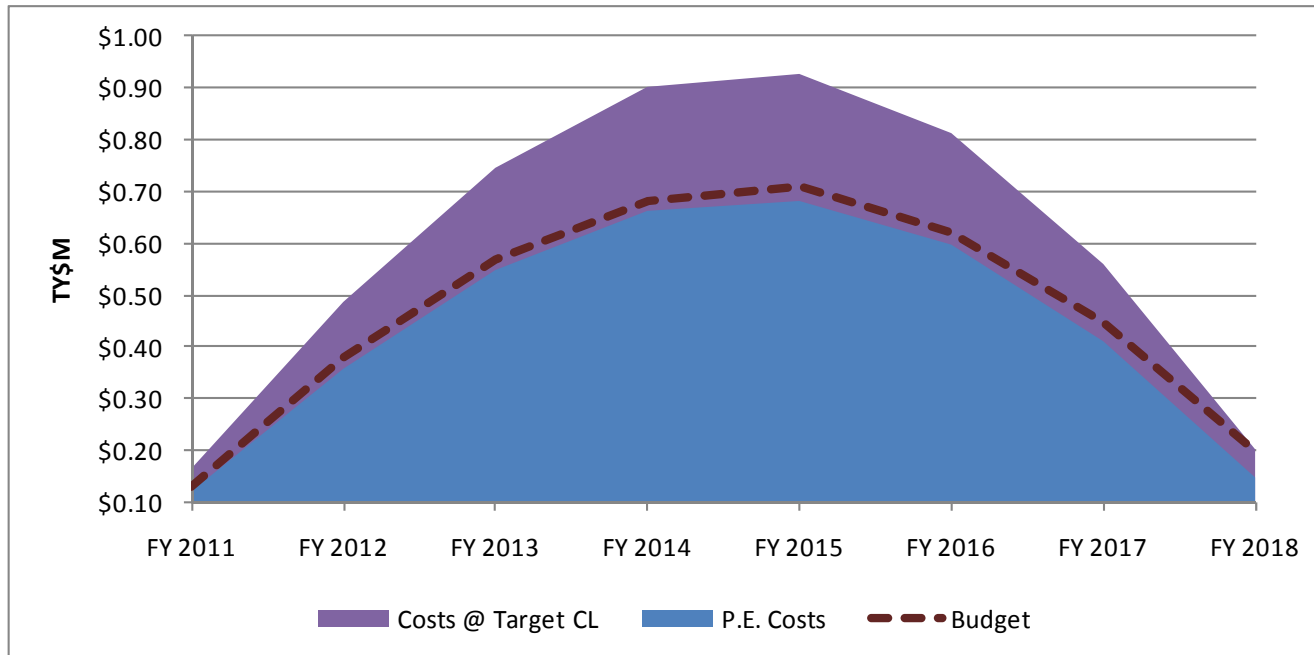
## ■ Time-Phased 70% risk-adjusted estimate

TY\$M	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Total
<b>70% CLE</b>	\$0.17	\$0.49	\$0.75	\$0.90	\$0.93	\$0.81	\$0.56	\$0.20	<b>\$4.81</b>



# Annual Budget & Risk Adjusted Cost Estimate

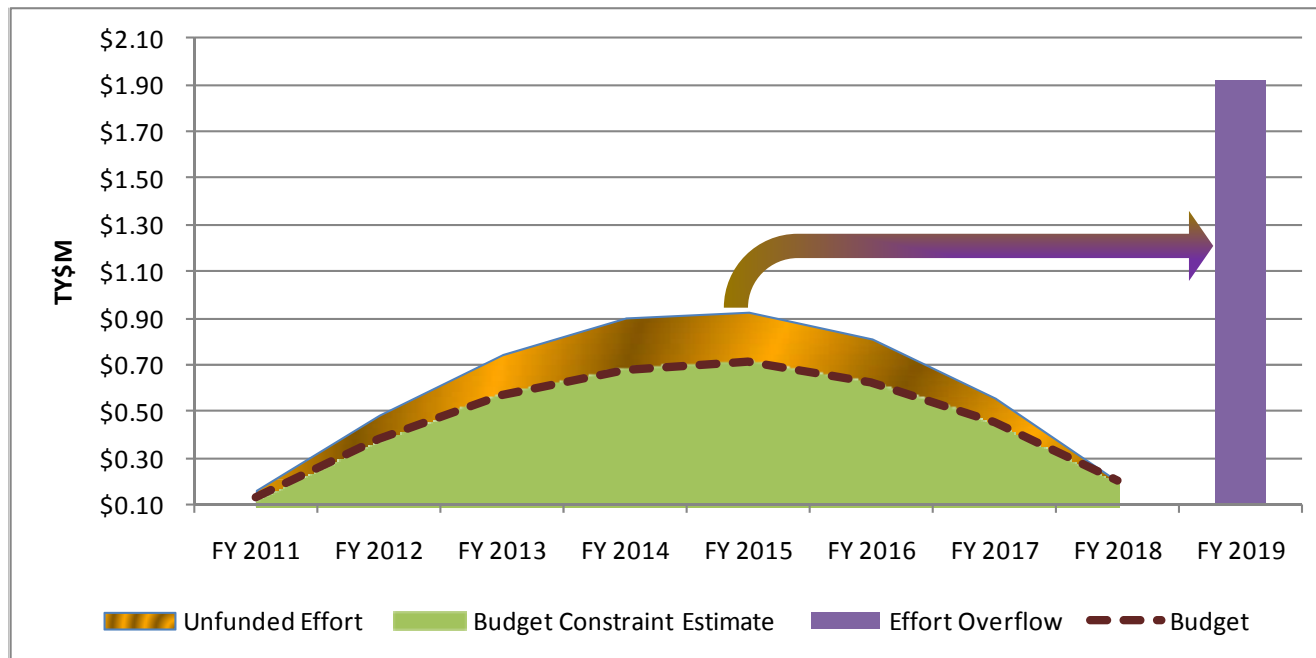
- Annual budget sufficient to cover estimated effort at the point estimate
- Situation becomes dire when we compare the 70% confidence level costs against the budget
  - Requires either budget increases in all years or an extension of the budget (from the peak) in order to fund rollover effort





# Determining Unfunded Effort

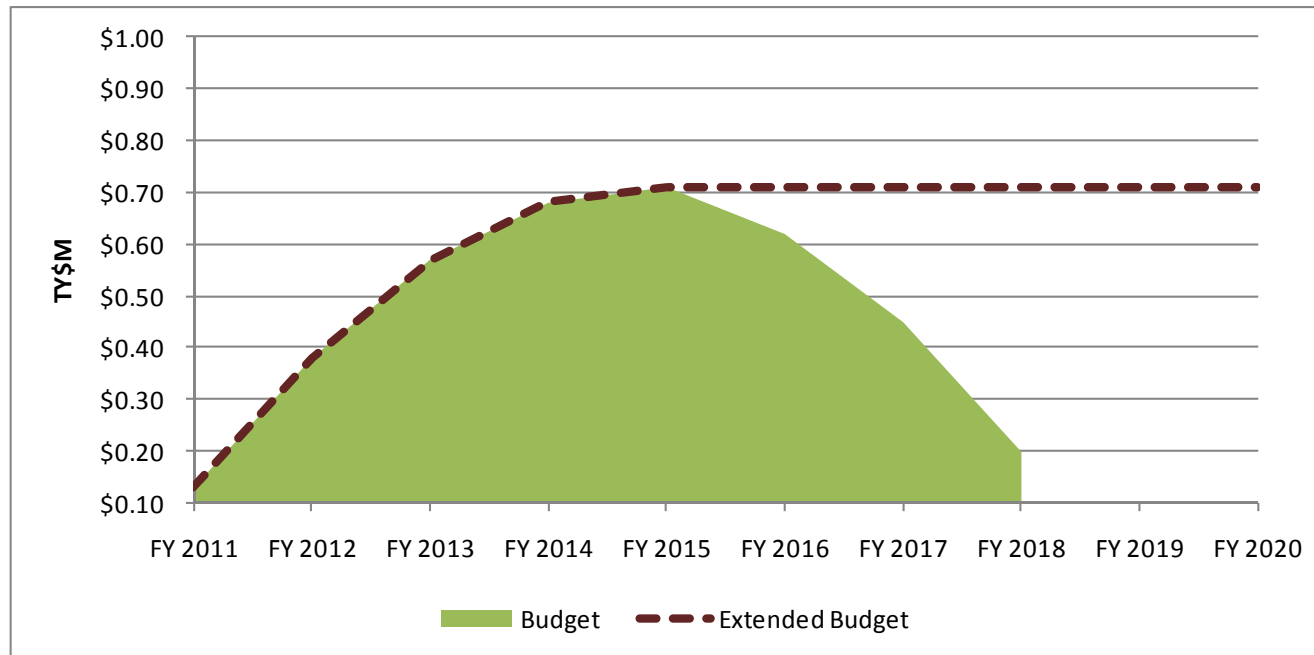
- Given no budget extension, how much estimated effort will not be covered by the current budget phasing?



- Shortfalls in effort can be addressed by increasing budget in underfunded years, reducing content/effort scope (i.e., cutting work) or obtaining additional budget in out-years to cover rollover effort



# Annual Budget vs. Extended Budget

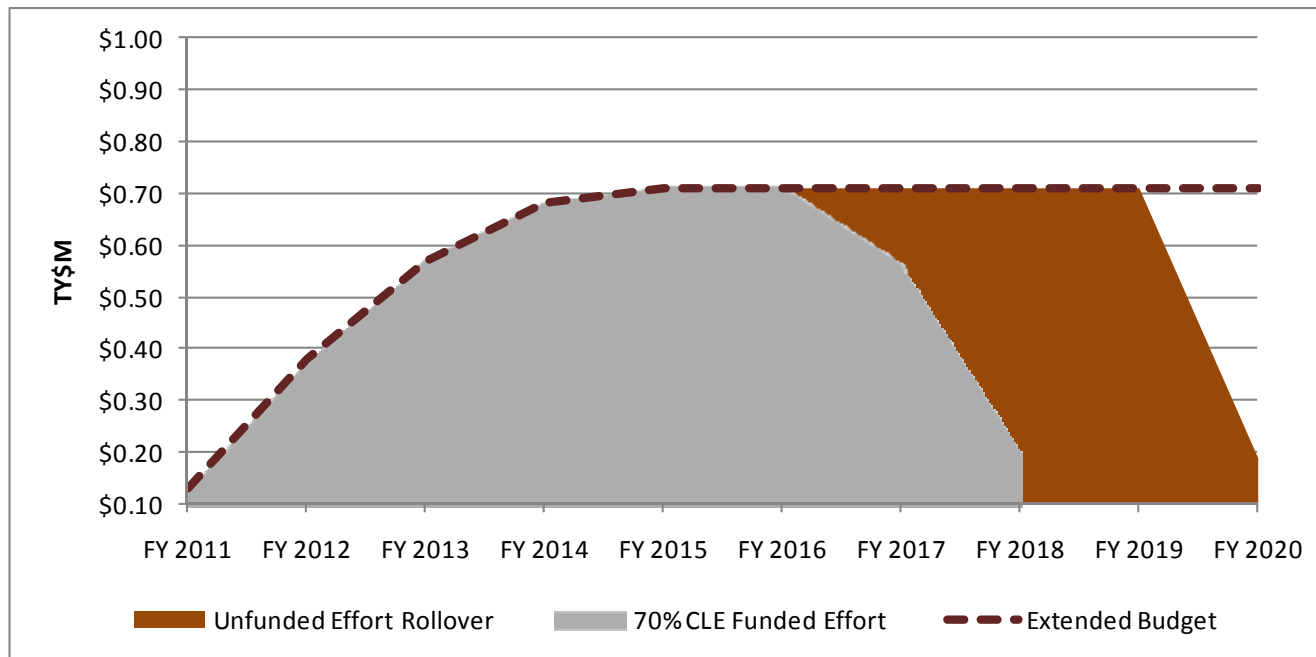


- **Extending the budget to provide coverage in the additional years for effort that slips due to budget shortfalls**
  - Obtaining funding at /near peak funding value is a scenario to consider when confronted with possible schedule slips
  - Allows for coverage of unfunded effort due to budget shortfalls



# Determining Potential Slips

- **With an extended budget, we can assess how many additional years are needed to cover all effort**



- **With an extended budget at the peak, we will require two additional years to cover effort that was pushed out**



# Model Results

- **At the point estimate, the annual budget sufficiently covers the estimated effort...**
- ***However, the 70% CLE case requires additional funding or an extended budget to cover shortfalls***
- **With extending the budget from the peak, the 70% CLE case requires 2 additional years to cover rollover effort**
  - *Potential slip in schedule!*





# What is FSCL?

- **Early FY Funding Shortfall Impact on Overall Project Confidence Level**
  
- **Methodology developed to quantify the impact of early year budget shortfalls on a risk adjusted estimate in ACE**
  - Original development sponsored by NASA HQ Cost Research Division
  - Presented by Alfred Smith and Melissa Cyrulik at the NASA Cost Symposium, April 2009
  
- **Compares the phased risk adjusted estimate against the annual budget**
  - Budget < cost estimate: interpreted as “effort” that must be added to the following year’s estimate
    - Provide for inflation and “productivity penalty” factors
  - Budget > cost estimate: savings passed to next year
    - Cost savings do not improve schedule (i.e. if dollars are saved in year 1, they are not used to commence year two work in year 1)
    - Assumes saved dollars can not be passed to another project
    - No inflation or penalty applied on savings passed to next year



# FSCCL Controls

- **FSCCL module has built in user controls for running excursions with the input data**
  - The user has the ability to:
    - Select the risk adjusted point estimate cost or a target confidence level cost value (i.e. 70% CLE)
    - Choose between an annual budget or budget extended from peak year
    - Allow cost savings to be passed to next year
    - Toggle the inflation penalty for rollover effort added to the following year
    - Toggle the productivity penalty for rollover effort added to the following year
    - Define Best Case, Most Likely, and Worst Case productivity penalty values
  
- **Special Cases: Methodology can be modified by user to address unique issues (e.g, Incorporating fixed and variable costs)**



# FSCCL Screenshot

	WBS/CES Description	Approp	Unique ID	Point Estimate	Phasing Method	Equation / Throughput	Fiscal Year	Units	Start Date	Finish Date	RI&K Specification	
15	<b>* Early FY Funding Shortfall Impact on Overall Project Confidence</b>		<b>*FSCCL</b>									
16	<b>** User Settings</b>		<b>*Settings</b>									
17	Set Target Confidence Level		FSCCL_TargetCL	70 *	C		70					
18												
19	Include Inflation (1=Yes, 2=No)		FSCCL_ChooseInflation	1 *	C		1					
20												
21	Penalty Factor Moving \$ to Next FY in Addition to Inflation		CL_ProductivityPenFact	1.1 *	C		1.1				Form=Triangular,	
22	Penalty Factor Low Value		ProductivityPenFactLow	1.1 *	C		1.1					
23	Penalty Factor High Value		ProductivityPenFactHigh	1.1 *	C		1.1					
24												
25	Allow Shifting of Budget ( 0 = No , 1 = Yes )		Toggle_ShiftBudget	0.000 *	C		0					
26	Extend Budget from Peak ( 0 = No, 1 = Yes )		Toggle_ExtendBudget	1.000 *	C		1					
27	Cost Confidence Level ( 0 = PE, 1 = Target CL )		Toggle_TargetCL	1.000 *	C		1					
28	<b>** Data Preparation</b>		<b>*DataPrep</b>									
29	Total Budget TY\$		TotBudgetTY\$	\$ 3.149 *								
30	Budget TY\$			\$ 3.149 *	F	Budget\$_Input * BYtoTY(R&D, FYBY, FYR)						
31	Budget Injection TY\$ (Enter additional budget as TY\$M in Yearly Phasing)			\$ 0.000 *	IS	[Input Throughput]						
32	Total Costs TY\$		TotalCosts_TY\$	\$ 3.536 (13%) *	F	Total_Est\$_Input * BYtoTY(R&D, FYBY, FYR)						
33												
34	FSCCL Budget		FSCCL_Budget	\$ 6.697 *	F	If(And(Toggle_ExtendBudget, FYR > FYCMaxYr@F), FYCVal(FYR - 1) - FYCVal(FYR - 2), FYCVal(FYR - 1) - FYCVal(FYR - 2))						
35	FSCCL Cost		FSCCL_Cost	\$ 4.298 *	F	If(Toggle_TargetCL = 1, FSCCL_Budget, FSCCL_Budget - FSCCL_ChooseInflation)						
36	<b>** FSCCL Calculations</b>		<b>*FSCCLCalc</b>									
37	Delta Between Cost and Budget TY\$		AvailDeltaToBudget_TY\$	*	F	[If( And( Not( Toggle_ShiftBudget ) ,						
38												
39	Rollover Costs for Penalty Factor			*	F	FYCVal(FYR - 1) - FYCVal(FYR - 2)					Not(	
40	Inflation By Year Penalty Factor		CL_Pen_InflationByYear	*	F	If( FYCVal@FSCCL_CumRollOver\$, FYR - 1) > FYCMaxYr@F, FYCVal(FYR - 1) - FYCVal(FYR - 2)			FYCFirstYr@F		Not(	
41	Shifting Costs Penalty Factor		FSCCL_Pen_FactByYear	*	F	If( FYCVal@FSCCL_CumRollOver\$, FYR - 1) > FYCMaxYr@F, FYCVal(FYR - 1) - FYCVal(FYR - 2)			FYCFirstYr@F		Not(	
42	Combined Adjustment		FSCCL_Pen_CombAdj	*	F	FSCCL_Pen_InflationByYear * CL_Pen_InflationByYear			FYCFirstYr@F		Not(	
43	Cumulative Rollover		FSCCL_CumRollOver\$	*	F	If( Toggle_ShiftBudget , ( FYCVal(FYR - 1) - FYCVal(FYR - 2))					Not(	
44												
45	Phased Results for Extended or Constraint Budget TY\$		PhaseBudgetConst_TY\$	\$ 4.666 *								
46	Total Phased Costs TY\$			4.666 *								
47	Phased results to the Peak Year			\$ 2.097 *	F	If( Toggle_ExtendBudget , FSCCL_Budget , Min( FSCCL_Budget - FSCCL_ChooseInflation, FSCCL_Budget - FSCCL_ChooseInflation))				FYCMaxYr@F	Form=PointEstimate,	
48	Phased results beyond Peak Year			\$ 1.258 *	F	If( And( FYR > FYCMaxYr@F, FSCCL_Budget - FSCCL_ChooseInflation > 0), FSCCL_Budget - FSCCL_ChooseInflation)					Form=PointEstimate,	
49	Phased Rollover Effort Beyond Last Year of Costs		PhaseRolloverEffort_TY\$	\$ 1.310 *	F	If( FSCCL_CumRollOver\$ < 0 , 0 , If( FSCCL_CumRollOver\$ > 0 , FSCCL_CumRollOver\$, 0))			FYCLastYr@F		Form=PointEstimate,	
50	<b>* Inputs/Outputs</b>		<b>*InputsOutputs</b>									
51	<b>*Input Model</b>											
52	Budget in BY\$	R&D	Budget\$_Input	\$ 2.782 *	TY	[Cost Throughput]		\$M				
53	Cost Estimate in BY\$	R&D	Total_Est\$_Input	\$ 3.120 (13%) *	BE		3.12	2010	\$M	01oct2010	30sep2018	Form=LogNormal,
54												



# Advantages of FSCCL

- **A quantitative analysis of effort that needs to be pushed out due to budgetary shortfalls**
- **FSCCL housed and runs in ACE**
- **Ease of inputs – Needs only a phased risk adjusted cost estimate and annual budget**
- **Relatively few calculation rows needed**



# Conclusions

- **Funding availability has the potential to push work out, which can lead to schedule slips in your program**
- **FSCCL quantifies the amount of effort pushed out**
- **We can use the cost risk analysis with FSCCL to “calibrate” the schedule**



Thank You!

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