Project Cost

How right is that feeling in my bones?

Fernando Patino
Customer Delivery Lead

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Project Controls
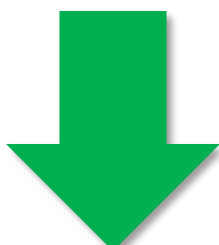EXPO
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Agenda

- What's the feeling in my bones?

- Quantifying that feeling

- Using Monte Carlo

  - Project variability factors and risk events

  - Teamwork and success-orientated conversation

- Conclusion & Questions

What's the feeling in my bones?

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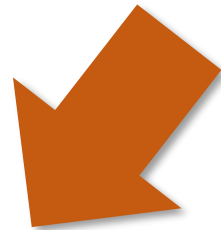
£100,000,000?

Total Contract Value

£100,000,000?

Delivery budget
£85,000,000?

Risk budget
£15,000,000?

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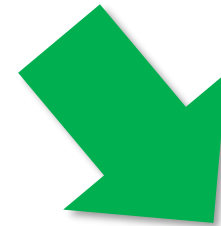
Quantifying that feeling

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Using Monte Carlo
Delivery budget

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Delivery Budget

Work item	Delivery estimate
Indirect works	
Work item 1	£100,000
Work item 2	£75,000
Work item ...	...
Work item 100	£1,100,000
Direct work	
Work item 101	£95,000
Work item 102	£57,000
Work item ... X	£131,000
TOTAL	**£89,000,000**

Delivery Budget

Total Contract Value
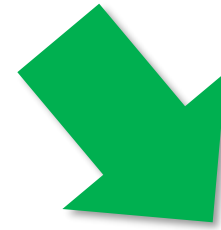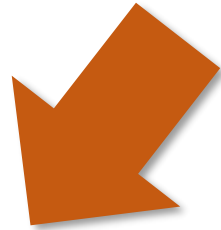
£100,000,000?

Deliver budget

£85,000,000?

£89,000,000?

Risk budget

£15,000,000?

£11,000,000?

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Delivery Budget

Total Contract Value

£89,000,000?

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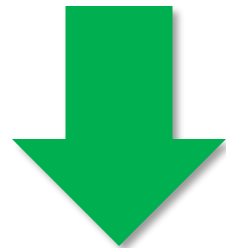
What are the variability factors?

Variability factors				
Variability	Optimistic	Likely	Pessimistic	Distribution
Steel quantity	90%	95%	110%	More likely to need less steel than single-point estimate
Steel rate	96%	100%	105%	Steel prices are not likely to vary much
Exchange rate	97%	---	103%	Even spread
Stone quantity	100%	---	105%	Even spread. Not likely to go down.
Stone rate	97%	105.00%	115%	More likely to vary upwards
Inflation	103%	---	106%	Even spread, depending on when things are paid for.
Labour (rate & qty)	98%	105%	115%	Will only go up (incl. delay), most likely by 5%.
Sub-contractor rate	98%	105%	110%	Up to +10% based on experience, most likely +5%

Variability factors	Applies to						
Variability	Work item 1	Work item 2	Work item 3	Work item 4	Work item 5	...	Work item X
	£100,000	£75,000	£350,000	£1,100,000	£220,000	...	£131,000
Steel quantity	TRUE						
Steel rate	TRUE						
Exchange rate	TRUE						
Stone quantity		TRUE					
Stone rate		TRUE					
Inflation	TRUE	TRUE	TRUE	TRUE	TRUE		TRUE
Labour (rate & qty)			TRUE				
Sub-contractor rate							

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Monte Carlo – variability

Variability: Stone rate	
Work item: 42	
Work item: 65	
Work item: 21	
Work item: 3	
Variability: Inflation	
Work item: 51	
Work item: 74	
Work item: 23	
Variability: Labour rate	

Monte Carlo – variability

Variability factors				
Variability	Optimistic	Likely	Pessimistic	Distribution
Steel quantity	90%	95%	110%	More likely to need less steel than single-point estimate
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Monte Carlo – variability

Most common cost outcomes

50% confident of budget of £75m

We could spend very little on risk, but unlikely

90% confident of £82m

£50m   £60m   £70m   £80m   £90m   £100m

Range of possible cost outcomes

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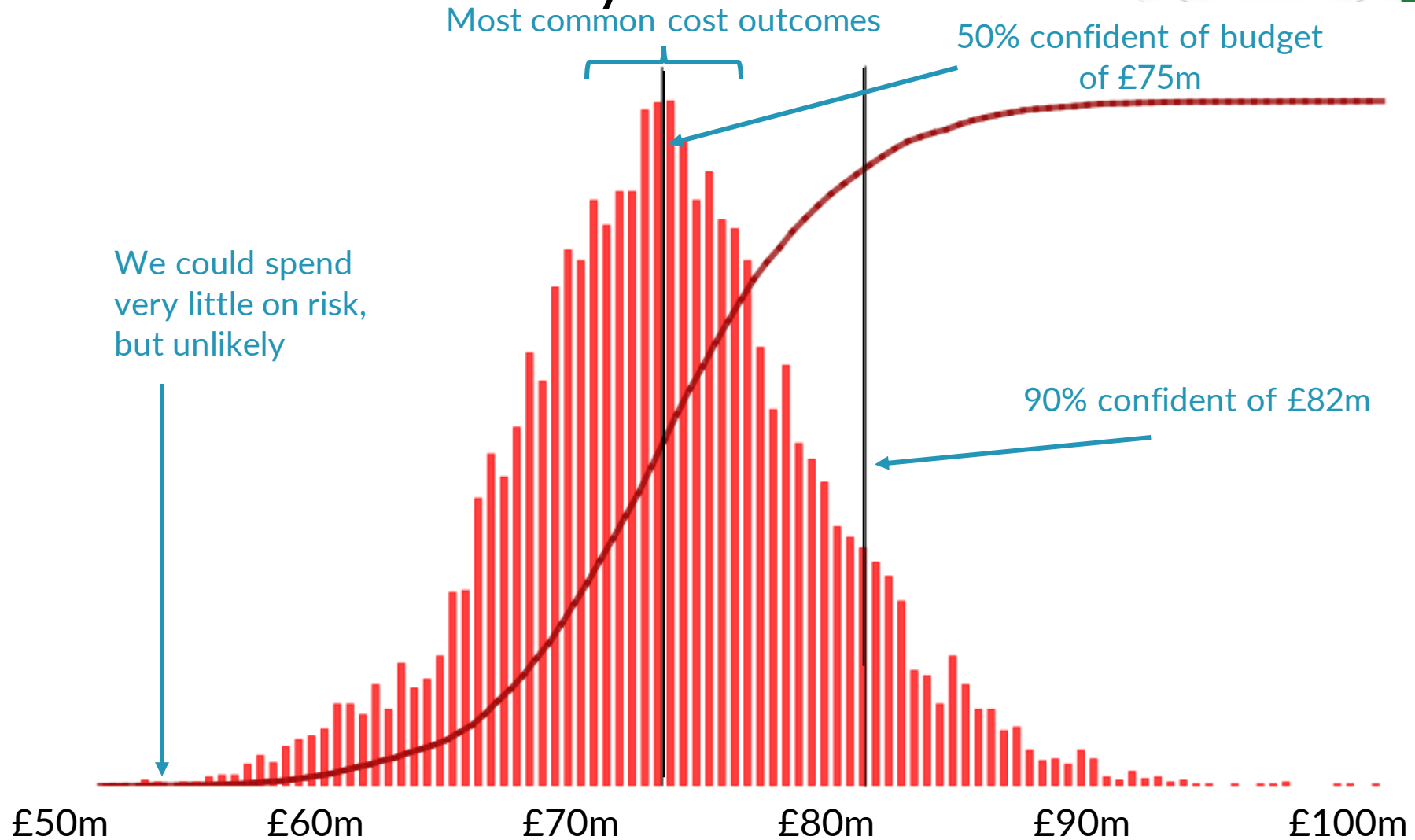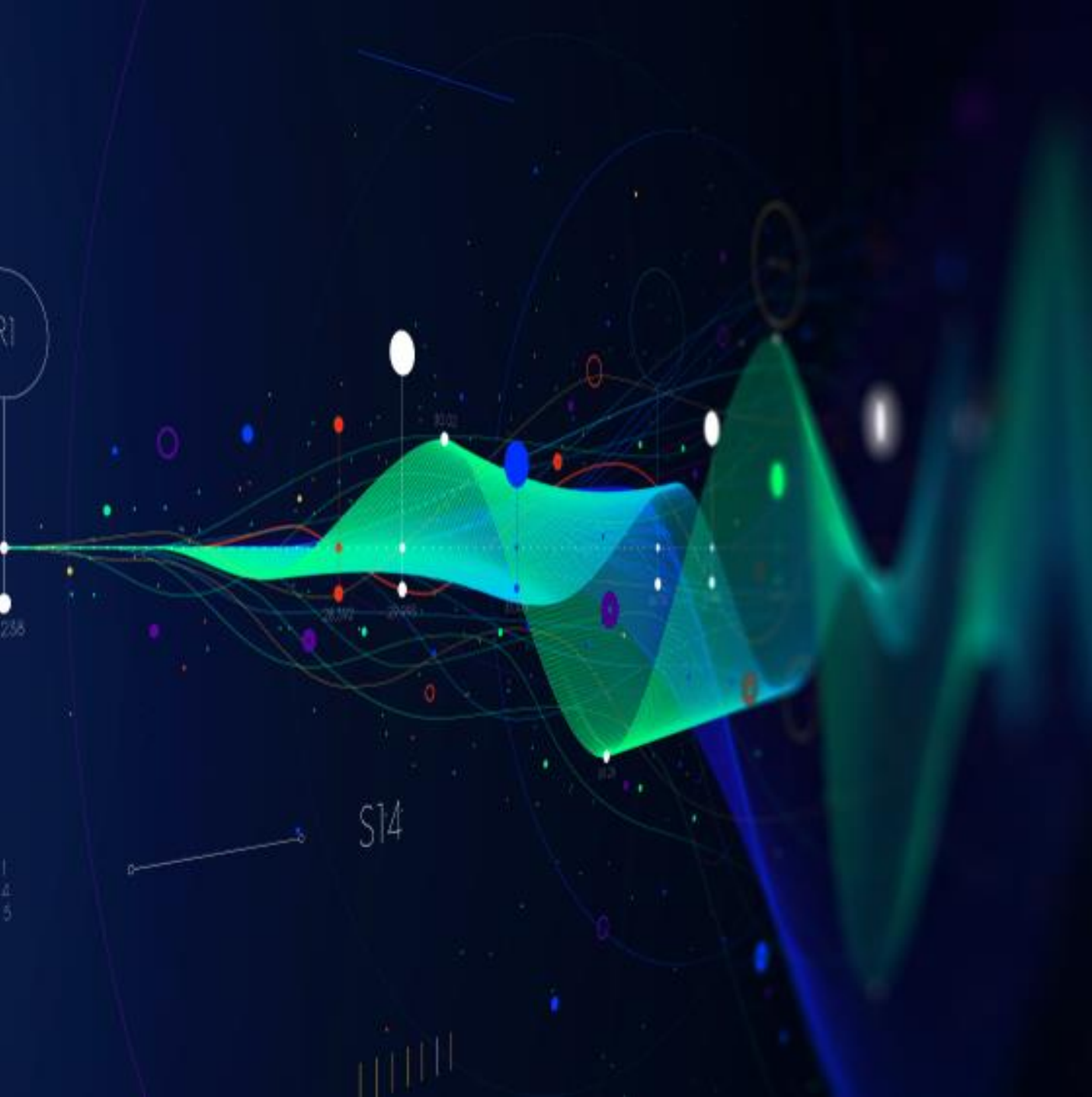
Risk Budget

Total Contract Value
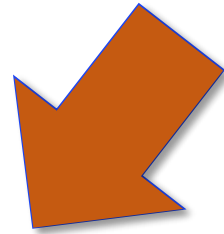
£100,000,000?

Deliver budget

~~£85,000,000?~~

~~£89,000,000?~~

£82,000,000?
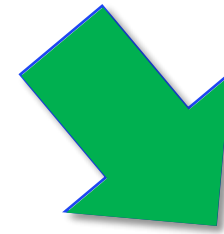
Risk budget

~~£15,000,000?~~

£18,000,000?

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What is risk?

- An event...

- ...that may or may not happen... ← **Probability (%) of occurrence**

- ...which should it occur... ← **But it might not!**

- ...will have an impact on your objectives.

  ↑

  For cost, this may not always be an exactly known amount

- e.g. There is a 25% chance that uncertain ground conditions will require £100,000 – £200,000 in rework

- Should we budget for the potential of every risk happening?

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Risk Register

Projects are inherently uncertain.

Any budget we set is one of many possible outcomes.

Bid 1: 37 items visible

Filters | Edit List | Bulk Update | Export to Excel | Import Schedule | Reports

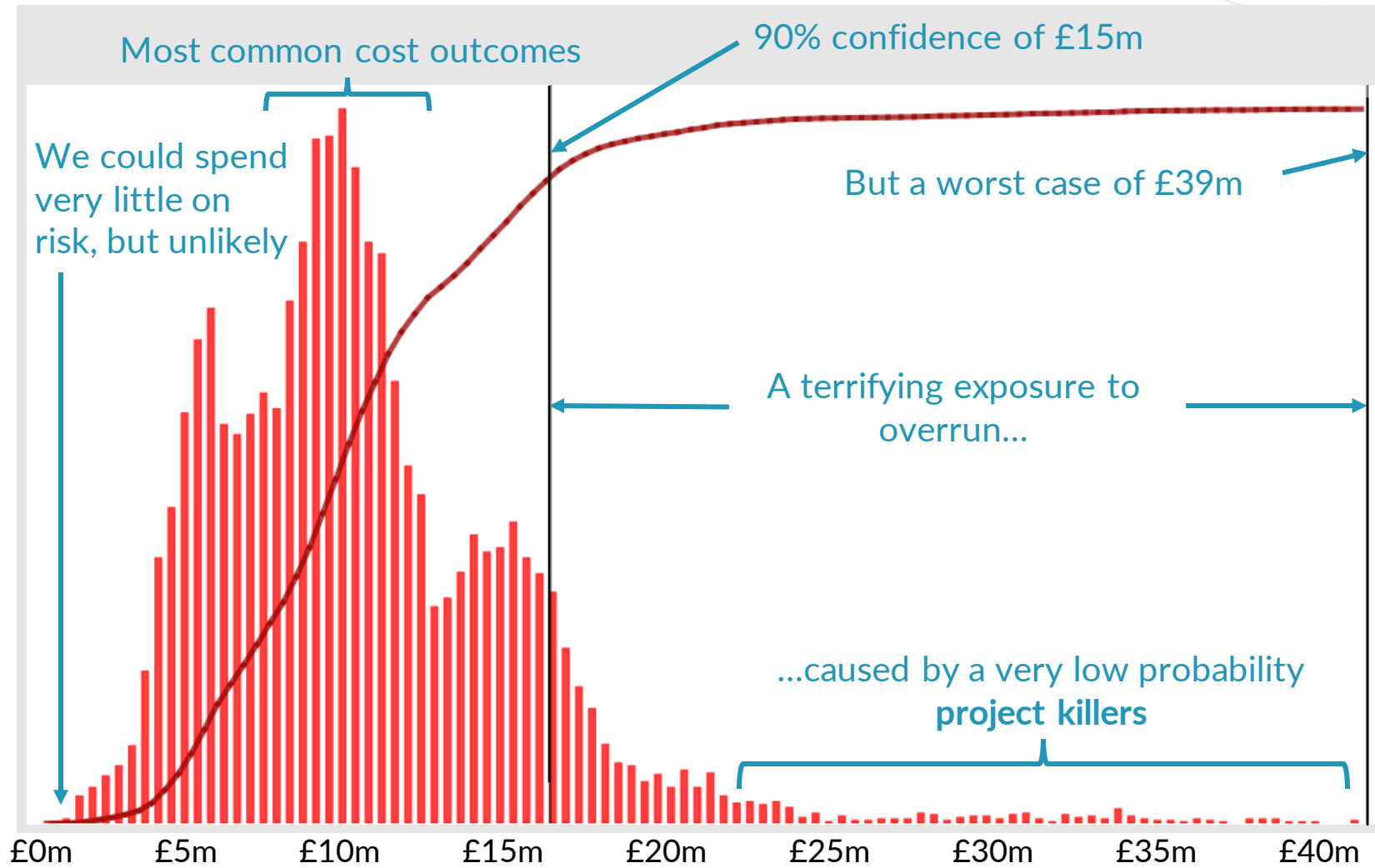| ID	Name	Probability - current	Financial min - current	Financial likely - current	Financial max - current	Score - current
T-31	Asbestos	20	425,000	500,000	650,000	Major (11)
T-22	Interaction between outages	90	95,000	120,000	135,000	Major (11)
T-47	Spoil may have to go off site	10	425,000	500,000	650,000	Significant (9)
T-40	Future expansion - design issues	1	850,000	1,000,000	1,300,000	Significant (9)
T-37	Outage due to unavailability of engineers	1	1,700,000	2,000,000	2,600,000	Significant (9)
T-33	Wildlife	50	85,000	100,000	130,000	Significant (9)
T-20	New earthing	10	425,000	500,000	650,000	Significant (9)
T-41	Long manufacturer lead times extending	20	85,000	100,000	130,000	Significant (8)
T-36	Engineering resource - safety documents	20	85,000	100,000	130,000	Significant (8)
T-23	Availability of free issue items	3	510,000	600,000	780,000	Significant (7)
T-35	Heavy Load Route	10	85,000	100,000	130,000	Significant (6)

The risk register, includes probability and impact estimates

Worst case: £39m   **Expected value:£11m**

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Montel Carlo – tells a story

Most common cost outcomes

90% confidence of £15m

We could spend very little on risk, but unlikely

But a worst case of £39m

A terrifying exposure to overrun...

...caused by a very low probability **project killers**

£0m   £5m   £10m   £15m   £20m   £25m   £30m   £35m   £40m

Range of possible cost outcomes

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Montel Carlo – point us at drivers

Dormice

Archaeological find

Nesting birds

Additional lighting

Insufficient IT for collaboration

Capacity

Insufficient safety documents

Works cause damage to buildings

Unreliable traffic model

Negotiate out of the contract?

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Montel **Carlo** – risk budget

Most common cost outcomes

50% confident of budget of £11m

We could spend very little on risk, but unlikely

90% confident of £15m

£0m   £5m   £20m   £15m   £20m   £25m

Range of possible cost outcomes

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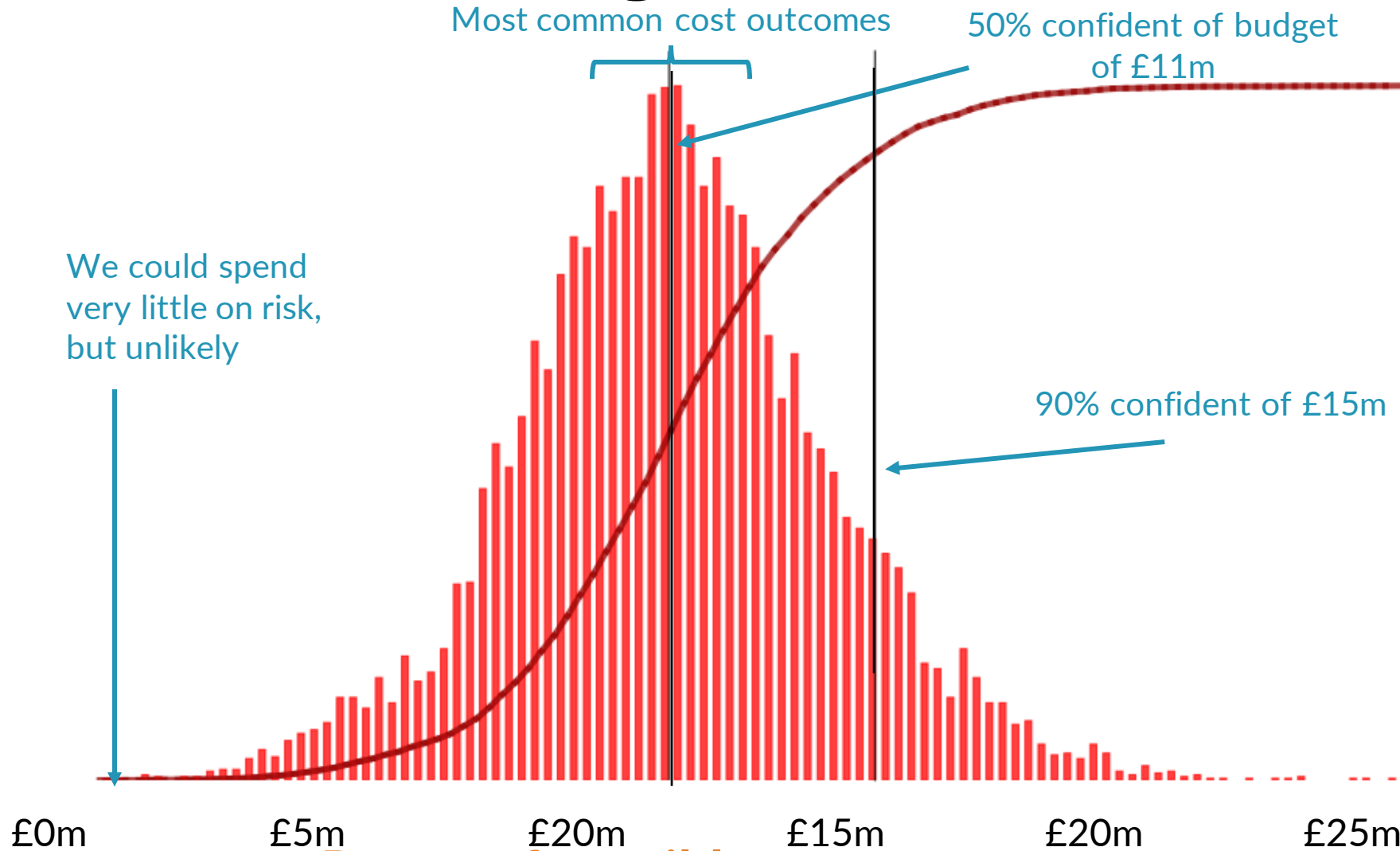
Montel Carlo – points us at drivers
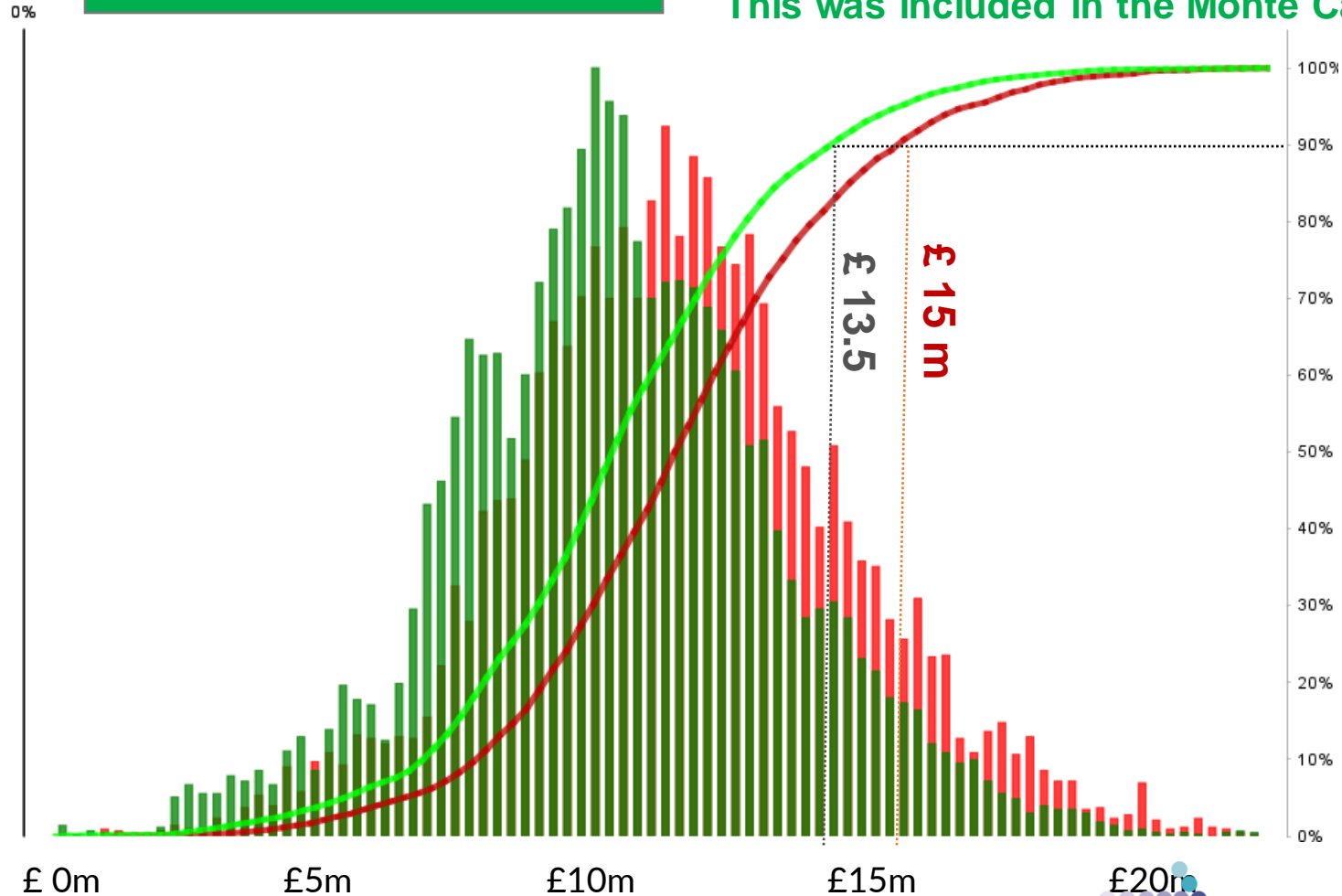

Where do we best focus our mitigation resources?

Savings through mitigation

Current: £15 m

Target: £ 13.5 m

Sounds good.

Is the mitigation cost justified?

This was included in the Monte Carlo.

£ 13.5

£ 15 m

£ 0m   £5m   £10m   £15m   £20m

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Delivery Budget

Total Contract Value

£100,000,000?

£95,500,000?

Decision? YES!

Deliver budget

£85,000,000?

£82,000,000?

Risk budget

£15,000,000?

£13,500,000?

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Montel Carlo analysis - summary

- **You provide your knowledge**

  - Work estimates

  - Variability factors

  - Probability and impact estimates for risks

- **Monte Carlo gives you insights**

  - Paints a picture of the range of outcomes

  - Promotes conversation and teamwork

  - Drives performance

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Conclusion
and Questions

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THANK YOU

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