GUIDE · 6 PAGES

PARV — putting a value on project risks

The probability-adjusted residual value of risk, step by step: PERT three-point estimates, mitigation, overlaps, escalation — on a worked wind farm.

Mayank Jain
Project finance · renewables · platform management
mjsir.org · Edition October 2026



PARV — putting a value on project risks

PARV is the **probability-adjusted residual value of risk**: what a risk could still cost after everything that would make good part of the loss, multiplied by how likely it is to happen. It turns a risk register into money, so risks can be compared with each other, with the project's value and with the cost of doing something about them. This guide builds it step by step, with **PERT** three-point estimates, on a worked example of our own.

1 Why scores are not enough

A classic risk register rates each risk for likelihood and impact on a 1–5 scale and multiplies the two into a score from 1 to 25. The score ranks risks and colours a heat map, which is useful, but it cannot tell you:

- whether a "15" construction risk is worth more than two "8" operating risks put together;
- how much of the project's value the whole register puts at stake;
- whether insurance costing USD 0.4 million a year is worth buying against a given risk.

Those questions need a number in currency. PARV gives one for each risk, built from the financial model rather than from judgement alone, so the scores and the money tell the same story.

2 The building blocks

Term	What it means	Where it comes from
Gross value of risk	The fall in value if the risk happens, before any mitigation that is not already in the base case. Measured as the fall in the equity NPV (or the project NPV).	A run of the model with the risk switched on, the debt held as it is.
Quantified mitigation	The part of that loss something would make good: liquidated damages, a warranty, an insurance claim, a price cap agreed in a contract.	The contracts and policies, in the same money as the gross value.
Residual value of risk	Gross value less the quantified mitigation (never below nil).	Arithmetic.
Probability after mitigation	The chance the risk happens over the period you are looking at, given the actions already taken.	Experience, studies, the technical adviser — written down with its reason.
PARV	Residual value × probability.	Arithmetic.

PARV = (gross value of risk − quantified mitigation) × probability after mitigation

gross value = the fall in the equity NPV the model gives when the risk happens

The **expected loss** you may have met elsewhere is the same product without taking off the mitigation: gross value × probability. PARV is the more honest measure for a structured project, because most project risks are partly passed on through contracts, and the register should show what the project company keeps.

3 Three-point estimates with PERT

PERT stands for **Program Evaluation and Review Technique**, a planning method from the late 1950s that estimated uncertain task durations from three points. The same idea suits any uncertain amount: instead

Free to read and share with credit to the author. For learning only — figures are illustrative; nothing here is financial, investment, tax or legal advice.

PARV — putting a value on project risks

PARV is the **probability-adjusted residual value of risk**: what a risk could still cost after everything that would make good part of the loss, multiplied by how likely it is to happen. It turns a risk register into money, so risks can be compared with each other, with the project's value and with the cost of doing something about them. This guide builds it step by step, with **PERT** three-point estimates, on a worked example of our own.

1 Why scores are not enough

A classic risk register rates each risk for likelihood and impact on a 1–5 scale and multiplies the two into a score from 1 to 25. The score ranks risks and colours a heat map, which is useful, but it cannot tell you:

- whether a "15" construction risk is worth more than two "8" operating risks put together;
- how much of the project's value the whole register puts at stake;
- whether insurance costing USD 0.4 million a year is worth buying against a given risk.

Those questions need a number in currency. PARV gives one for each risk, built from the financial model rather than from judgement alone, so the scores and the money tell the same story.

2 The building blocks

Term	What it means	Where it comes from
Gross value of risk	The fall in value if the risk happens, before any mitigation that is not already in the base case. Measured as the fall in the equity NPV (or the project NPV).	A run of the model with the risk switched on, the debt held as it is.
Quantified mitigation	The part of that loss something would make good: liquidated damages, a warranty, an insurance claim, a price cap agreed in a contract.	The contracts and policies, in the same money as the gross value.
Residual value of risk	Gross value less the quantified mitigation (never below nil).	Arithmetic.
Probability after mitigation	The chance the risk happens over the period you are looking at, given the actions already taken.	Experience, studies, the technical adviser — written down with its reason.
PARV	Residual value × probability.	Arithmetic.

PARV = (gross value of risk − quantified mitigation) × probability after mitigation

gross value = the fall in the equity NPV the model gives when the risk happens

The **expected loss** you may have met elsewhere is the same product without taking off the mitigation: gross value × probability. PARV is the more honest measure for a structured project, because most project risks are partly passed on through contracts, and the register should show what the project company keeps.

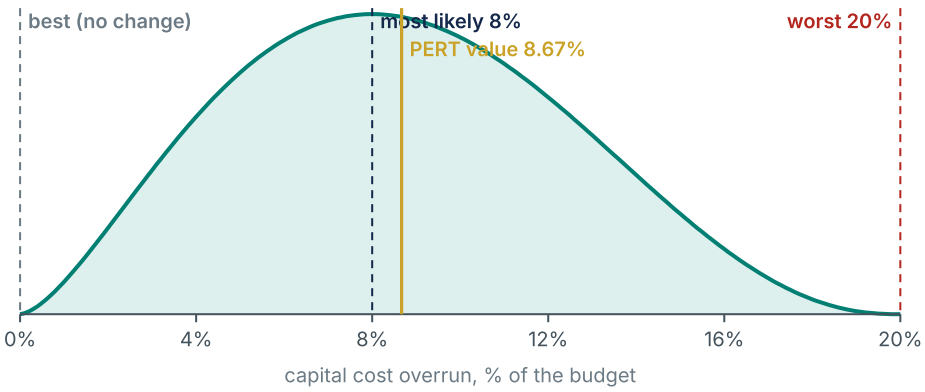
3 Three-point estimates with PERT

PERT stands for **Program Evaluation and Review Technique**, a planning method from the late 1950s that estimated uncertain task durations from three points. The same idea suits any uncertain amount: instead

of one guess, give the **best** case (often "no change" for a downside risk), the **most likely** and the **worst**. PERT weights the most likely four times:

PERT value = (best + 4 × most likely + worst) ÷ 6 · spread (standard deviation) ≈ (worst – best) ÷ 6

For a capital cost overrun with best 0%, most likely 8% and worst 20%, the PERT value is (0 + 4 × 8 + 20) ÷ 6 = **8.67%** and the spread about 3.3 points. The value sits a little above the most likely because the worst case is further away than the best: the tail to the right pulls the average up. A simple triangle average, (0 + 8 + 20) ÷ 3 = 9.33%, would give the tail more weight; PERT is the usual middle way.



The PERT (beta) distribution behind the three points: most likely 8%, PERT value 8.67%.

Run the model at the PERT value, not at the worst case

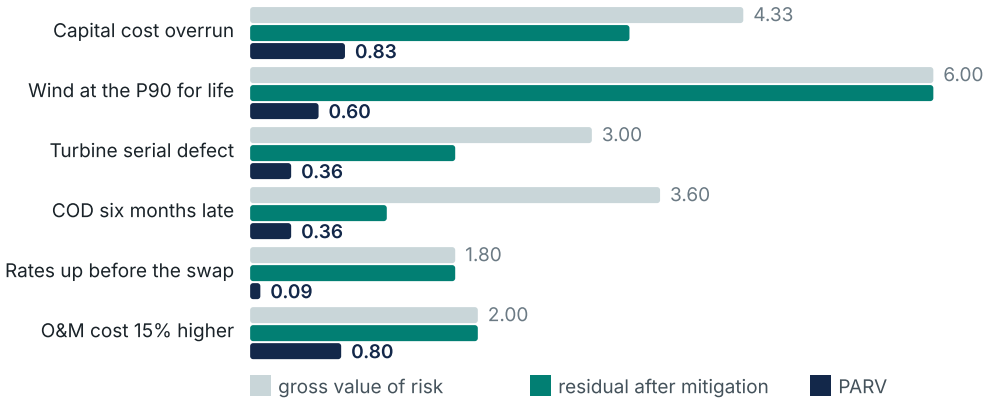
The gross value of risk should be the fall at the PERT value of the change. Running every risk at its worst and then applying a probability counts the bad news twice: once in the size and again in the likelihood.

4 A worked example

A 50 MW onshore wind farm: cost USD 55 million, 70% debt, the equity's NPV in the base case **USD 12.0 million** at the cost of equity. Six quantified risks, each run through the model with the debt held as it is (all figures USD million, illustrative):

Risk (what the run changes)	Gross	Mitigation	Residual	Probability	PARV	Group
Capital cost overrun on the owner's scope — PERT 0 / 8% / 20% → 8.67%	4.33	1.00	3.33	25%	0.83	
Wind resource at the P90 for the life, not the P50	6.00	–	6.00	10%	0.60	output
Turbine serial defect — availability 3 points lower, repairs	3.00	1.20	1.80	20%	0.36	output
Commercial operation six months late	3.60	2.40	1.20	30%	0.36	
Interest rates 1 point higher before the swap is struck	1.80	–	1.80	5%	0.09	
Operation and maintenance cost 15% higher	2.00	–	2.00	40%	0.80	
Total	**20.73**	**4.60**	**16.13**		**3.04**	

Where the mitigations come from: a capped price agreed for the grid connection (1.00); the turbine supplier's availability guarantee, whose damages are capped (1.20); the contractor's delay damages, which cover the lost revenue for part of the delay (2.40). The wind resource, rates before the swap and operating costs have nothing quantified against them.



Each risk three ways: what it could cost, what the project keeps after mitigation, and PARV.

The ranking changes at every step. The P90 wind case is the largest gross risk but, being unlikely, only the third PARV; the operating cost rise looks modest but is the second-largest PARV because it is quite likely; the delay is the second-largest gross risk after the wind, yet the contractor's damages take most of it away.

5 Adding up without counting twice

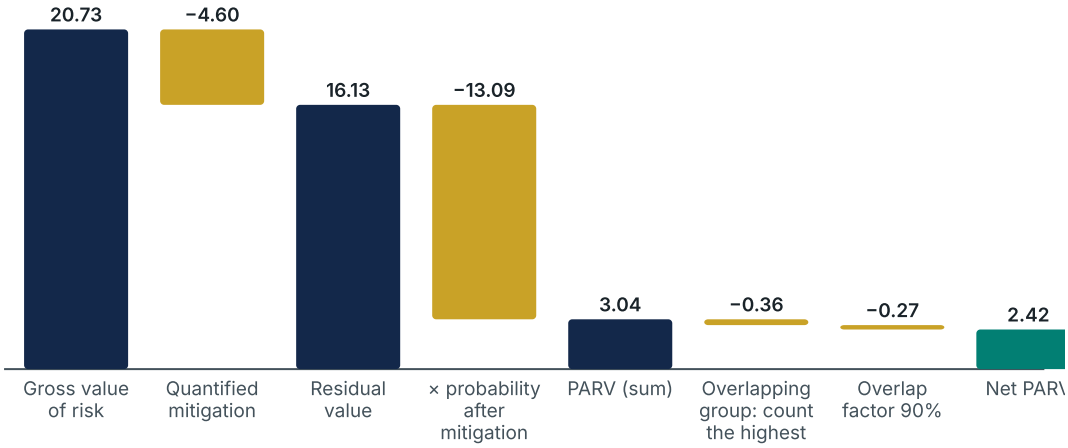
Summing the PARVs gives 3.04, but two corrections are needed before it means anything.

Risks that overlap or exclude each other — count the highest

The independent yield study behind the P90 already includes uncertainty about availability and turbine performance. Adding a separate "turbine defect" risk on top counts part of the same shortfall twice. Put the two in one **group** and count only the higher PARV (0.60): the group's total is 0.60, not 0.96. The same rule fits risks that cannot both happen — a contract terminated early and a contract price renegotiated down, say.

The overlap factor

Risks that can happen together rarely add up exactly. Run the main ones at once and compare: capital overrun, P90 wind and the delay together cut the equity NPV by 12.6, against 13.93 for the three run one by one, so the **overlap factor** is 12.6 ÷ 13.93 ≈ **90%**. The sum after the groups (2.68) × 90% gives the **net PARV: USD 2.42 million — about 20% of the equity NPV**.



From the gross value of risk to the net PARV (USD million, illustrative).

When risks compound instead

Sometimes the combined run costs *more* than the sum: a lower output and a higher cost together may breach the distribution lock-up, trapping cash that neither did alone. Then the factor would be above 100%. Keep it at 100% in the total and write the compounding up as its own risk, with the run that shows it.

6 What deserves the board's attention — escalation

PARV rewards likely risks and can hide rare but severe ones: the P90 wind case could take half the equity's value, yet its PARV is only 0.60. So the register flags risks for escalation on several tests, not one:

- **Severe impact**, whatever the probability — a residual value above, say, a quarter of the equity NPV.
- **Thin evidence for a good score** — a risk rated high or extreme whose PARV is under a quarter of its gross value relies heavily on its mitigation or its low probability; check the contract really pays and the probability has a reason.
- **A material PARV** — above a threshold the board sets, such as 10% of the equity NPV (1.2 in the example).

In the example no single PARV passes 1.2, but the P90 wind (6.00 residual, half the NPV) and the capital overrun (3.33) pass the severe-impact test and go to the board with the question: is the mitigation enough, and what would more cost?

7 Using PARV to decide

A mitigation is worth buying when it removes more PARV than it costs, in the same money. Suppose a cost-overrun insurance would cover half the overrun on the owner's scope for a premium worth 0.30 today. It cuts the capital overrun's residual from 3.33 to 1.17 (half of 4.33 off the gross), so its PARV from 0.83 to 0.29 — a fall of 0.54 for a cost of 0.30. Worth it on average; and it also takes the risk off the severe-impact list.

Track PARV over time as well: a construction risk's PARV should fall to nil by the commercial operation date, and an operating risk's should shrink as its exposure runs off.

8 Pitfalls

- **Probability before mitigation** used with a residual after it — or the other way round. Be consistent.
- **Re-sizing the debt in the run** — the equity looks protected because the loan shrank. Hold the debt.
- **Worst cases with probabilities** — see section 3: run at the PERT value.
- **Mitigation counted twice** — damages already in the base case are not mitigation again.
- **PARV read as a forecast** — it is an average across outcomes, not what will happen; one risk either happens or does not.
- **Precision for its own sake** — a 25% probability is a judgement; write down why, and test 15% and 35%.

In Project Finance Studio: Output › Risks runs ten quantified and five qualitative risks with the debt held. Each risk's *PARV* button takes PERT points, the quantified mitigation and a group; the register shows the gross value, the residual, PARV, the net PARV with the overlap factor, and the escalation flags; Learn: PARV and Learn: PERT explain the terms. The Excel workbook's Risks sheet carries the same calculations as live formulas.

The project and figures in this guide are illustrative, built for teaching. Nothing in it is financial, investment, tax or legal advice.