QINETIQ

Case Study

Wireless Power Transfer Analysis

Using Programme due diligence to analyse key questions around an emerging technology

Executive summary

QinetiQ's Advisory Services team helps clients to assess the feasibility of concepts and projects together with the estimated cost and schedule across the entire lifecycle of the technology in question. Our consultants used QinetiQ Programme due diligence to analyse key questions around the emerging technology of wireless power transfer. Monte Carlo analysis techniques enabled us to include the effects of uncertainty and risks in the whole life cost estimates that we generated for our clients.

" QinetiQ have a range of technical experience, deep subject matter expertise and strategic decision support capabilities, which are deployable to assist clients with complex decisions. "

Amanda Coleman, QinetiQ, Chief Scientist - Analysis and Consultancy

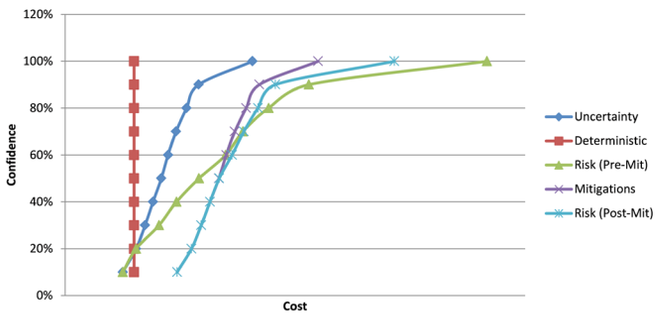
The brief

A client contracted with QinetiQ's Advisory Services team to assess an emerging technology, known as wireless power transfer (WPT), which involves wireless transmission of electrical energy across an air gap without connectors or wires. QinetiQ's technical team were tasked with considering the following questions:

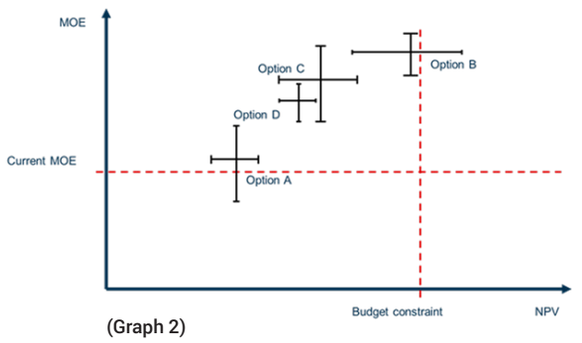
- Is WPT feasible?
- How long would it take to develop?
- What will it cost?

" Risk analysis software - @RISK enabled our subject matter experts to provide the client with an indication of the range of outcomes for the delivery date and the potential funding requirements. "

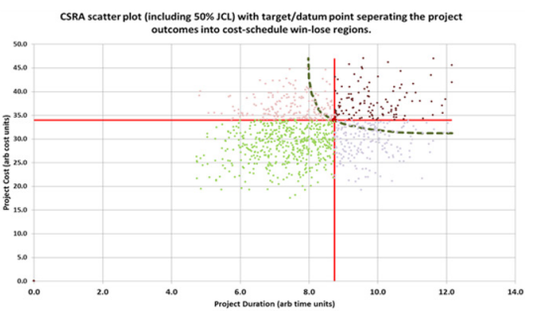
Dale Shermon - QinetiQ Fellow, Managing Consultant



(Graph 1)



(Graph 2)



(Graph 3)

Our solution

We used @RISK by Palisade to analyse the combined cost and schedule uncertainty and risk impact foreseen by our subject matter experts, enabling us to provide the client with an indication of the range of outcomes for the delivery date and the potential funding requirements.

Once the baseline duration and funding is established through detailed discussion with our technical, engineering and scientific staff, we considered the uncertainty around their most likely point estimates. This three-point estimate (3PE) considers the minimum and maximum (time and cost), in addition to the most likely, assuming normal working practices. It reflects the fact that the baseline estimate has variation.

We also considered potential deviations from the planned baseline activities. The risk events that cause deviations will have a trigger, resulting in potential additional funding requirements and slippage in the schedule. We quantified these risk events in terms of probability of occurrence and their three-point impact when they occur; for example, unknown atmospheric and/or weather-related attenuation results in unacceptable transmission losses, some systems cannot be manufactured as modular units, technology readiness level (TRLs) for some modular systems fail to attain the necessary maturity level, or lack of supply chain capacity.

After running the analysis through @RISK, we developed S-curves, or cumulative probability distributions, as outputs that inform the decision maker of the potential delivery date or budget required, at a given confidence. The S-curves portray the uncertainty (due to the 3PE), pre-mitigation risk, and post-mitigation risk, enabling decision makers to make proactive, evidence-based decisions with regards to funding or not funding mitigating actions. **(Graph 1)**

We considered alternative viable options that could satisfy the WPT requirement, and assessed them in terms of their trade-off of performance, time and cost. To illustrate these options, we plotted the investment appraisal (IA) measured financially and discounted to a net present value (NPV) figure on the x-axis. This was combined with the measure of effectiveness (MOE) resulting from operational research (OR) measuring the benefits or ability for the option to satisfy the client's requirements. Using this graph we established the options to be excluded because they were beyond an upper budgetary constraint and unaffordable, or below a MOE threshold and not able to provide a minimum performance. This left us to assess the optimum value for money (VfM) alternative, including a narrative around the magnitude of the variability within the options. **(Graph 2)**

Finally, we conducted a combined cost and schedule analysis to simulate the completion date of the work and cost, giving the decision maker a view of the potential chance of achieving delivery dates at a potential funding level. **(Graph 3)**

Outcomes and benefits

- Delivery of a technical feasibility report to the client regarding the development of WPT

- Demonstrated that the client's anticipated delivery date was optimistic, and that the schedule would be potentially several times longer than they had originally expected

- Confidence in the risk adjusted whole life cost and schedule required to bring the project to maturity through the application of multiple estimating techniques.

QinetiQ is always on your side, protecting, improving and advancing your vital interests

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