Australian Government
Department of Infrastructure and Regional Development

National Public Private Partnership Guidelines

Volume 4: Public Sector Comparator Guidance

December 2008

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Components of the Guidelines

National PPP Policy Framework

National PPP Guidelines Overview

National PPP Detailed Guidance Material

- Volume 1: Procurement Options Analysis
- Volume 2: Practitioners' Guide
- Volume 3: Commercial Principles for Social Infrastructure
- **Volume 4: Public Sector Comparator Guidance**
- Volume 5: Discount Rate Methodology Guidance
- Volume 6: Jurisdictional Requirements
- Volume 7: Commercial Principles for Economic Infrastructure
- Roadmap for applying the Commercial Principles

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Acknowledgement

This Public Sector Comparator Guidance is based on the Victorian Government's *Partnerships Victoria* guidance material and the New South Wales *Working With Government* Guidelines.

Table of contents

1 Introduction

1.1 The National PPP Guidelines

Australian governments are committed to investing in infrastructure and delivering improved services to the community. Infrastructure investment is critical to our economic prosperity, and governments across jurisdictions currently seek the participation of the private sector in the delivery of infrastructure and related services to the public. Public Private Partnership ("**PPP**") arrangements are one way of delivering infrastructure investment.

The National PPP Guidelines (the "**Guidelines**") have been prepared and endorsed by Infrastructure Australia and the State, Territory and Commonwealth Governments as an agreed framework for the delivery of PPP projects. The guidelines provide a framework that enables both the public and private sectors to work together to improve public service delivery through private sector provision of infrastructure and related non-core services.

These Guidelines set a framework for the procurement of PPPs on a national basis, and apply across State, Territory, and Commonwealth arrangements.

As a general principle, it is expected that a high degree of uniformity and agreement has been achieved in these Guidelines. However, specific requirements of individual jurisdictions, where different or in addition to the Guidelines, will be detailed in *Jurisdictional Requirements documents.* These will need to be read in conjunction with the Guidelines to detail the framework relevant for the procurement of PPP projects in individual jurisdictions.

Further guidance on how these Guidelines are to be applied to PPP projects within individual jurisdictions (in terms of when the guidelines will need to be adopted) is detailed in the *National PPP Policy Framework*.

1.2 The Public Sector Comparator ("PSC") Guidance

The *PSC Guidance* is one of the detailed guidance documents that form part of the Guidelines. It provides guidance to government departments and agencies across jurisdictions on the process for, and issues associated with, the development of the PSC.

1.3 Structure of the *PSC Guide*

The *PSC Guidance* has been structured in two parts:

- **Part One** provides a range of technical guidance on the methods for the development of a PSC; and

- **Part Two** provides a worked example for the practical development of a PSC.

Sections 2 through 9 in part one and the worked example provided in part two primarily consider a social infrastructure type project. Sections 10 through 18 provide the worked example demonstrating the practical development of a PSC.

1.4 Supporting material

The suite of publications comprising the Guidelines is as follows*:*

National PPP Policy Framework

National PPP Guidelines Overview

National PPP Detailed Guidance Material

- Volume 1: Procurement Options Analysis
- Volume 2 : Practitioners' Guide
- Volume 3 : Commercial Principles for Social Infrastructure
- Volume 4 : Public Sector Comparator Guidance
- Volume 5 : Discount Rate Methodology Guidance
- Volume 6 : Jurisdictional Requirements

Jurisdictional Requirements Documents will provide details of individual jurisdictional requirements and will need to be read in conjunction with the Guidelines.

In addition, there is a *National PPP Policy Framework* that details the scope and application of the Guidelines across jurisdictions.

Separate procurement strategy guidance has also been produced by Infrastructure Australia to support implementing the Policy Framework.

1.5 Updates

Updates to the *National PPP Guidelines* will be published, from time to time, on the National PPP Guidelines website (www.infrastructureaustralia.gov.au).

Part One: Technical Guidance

2 Overview of the PSC

2.1 Definition of the PSC

The PSC is an estimate of the hypothetical, whole-of-life cost of a public sector project if delivered by government. The PSC is developed in accordance with the required output specification, the proposed risk allocation and is based on the most efficient form of government delivery, adjusted for the lifecycle risks of the project. This is referred to as the Reference Project.

A PSC is a model of the costs (and in some cases, revenues) associated with a Proposal under government delivery. A PSC:

- is based on the most efficient likely method of providing the defined output currently available to the public sector;
- takes into account the potential impact of risks on the costs (and revenues) associated with a proposal over its life; and
- is expressed in terms of the net present cost (or value) to government of providing the output, over the life of the proposed contract period.

The PSC reference project will be defined and costed to provide the same level and quality of service expected of the private sector.

2.2 Purpose of the PSC

The purpose of the PSC is to provide governments with a quantitative measure of the value for money it can expect from accepting a private sector Proposal to deliver the output specification compared to public sector delivery.

Given that the PSC is a valuable tool for government in determining value for money, it is important that it is prepared carefully and comprehensively.

The PSC therefore provides government with an approximate measure of the range of outcomes that Government is likely to face in delivering a project under traditional methods. To maintain its usefulness as a tool, the PSC will be:

- accompanied by qualitative considerations in determining the potential value for money of a PPP arrangement;
- subject to sensitivity testing and scenario analysis to determine the robustness of its underlying assumptions, and their impact on the PSC's results; and
- sufficiently flexible to allow new information to be incorporated as it comes to light enhancing the integrity of the PSC as a benchmark while maintaining the probity of the project development and tender assessment processes.

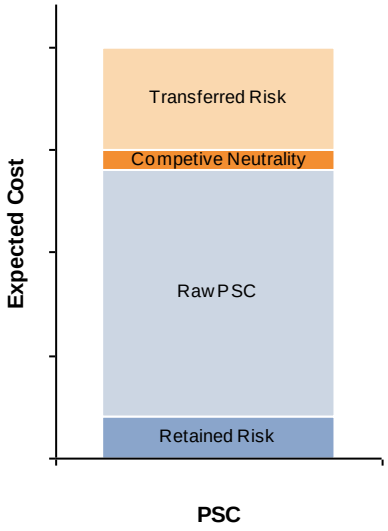
2.3 Components of the PSC

The PSC comprises four elements:

- Retained risk;

- Raw PSC (base costing);
- Competitive neutrality; and
- Transferred risk.

Figure 2-1 Components of a Public Sector Comparator



These components highlight that a PSC should represent the *total lifecycle cost to government* of meeting the output specification under direct public procurement.

The key characteristics of the PSC are that:

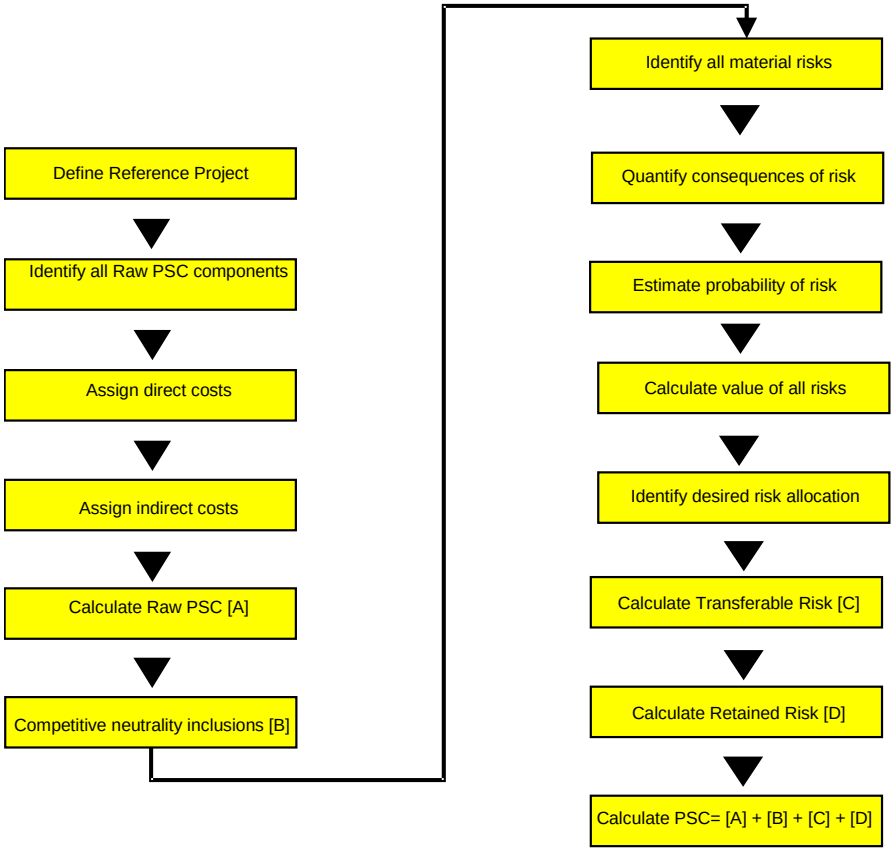
- it is expressed as the Net Present Cost of a projected cash flow based on the project-specific discount rate over the life of the contract;
- it represents the most efficient form of public sector delivery;
- it includes an adjustment for Competitive Neutrality; and
- it contains an assessment of the value of the risks that are to be transferred to bidders and the risks that are to be retained by government.

PSC = Raw PSC + Competitive Neutrality + Transferred Risk + Retained Risk

2.4 Major phases in developing the PSC

The recommended process for the development of a PSC is illustrated in Figure 2-2.

Figure 2-2: The PSC development process



The steps in constructing a PSC are described in detail in this document. It is recommended that these steps be followed sequentially, as each component of the PSC is built on information provided at the previous step. For example, in developing the raw PSC, the Project Team need to focus on estimating direct and indirect costs as accurately as possible. It is more productive to complete this stage before attempting to identify and value risks, which are derived from the cost (and revenue) identified in the Raw PSC. If the Raw PSC costs are inaccurate, by definition the risk analysis will also be flawed and the process will need to be restarted.

2.5 When to use a PSC

A PSC is used when considering a quantitative value for money assessment in delivering a project using a PPP arrangement. In these cases, a benchmark and formal evaluation process is to be used for PPP projects to assist in the quantitative assessment of whether bids offer better value for money than public procurement.

3 General Issues

3.1 Value for money

Value for money is a critical focus of PPP procurement. The value for money assessment allows procuring agencies to establish whether service delivery has been structured to appropriately meet the service output while continuing to ensure reasonable stewardship of financial resources.

The assessment of value for money should encompass all aspects of the Proposal including both quantitative and qualitative elements.

3.1.1 The PSC and quantitative assessment

The PSC is the key management tool in the quantitative assessment of value for money during the tender process and the evaluation and comparison of RFP Responses. The RFP Responses will be assessed against the PSC to determine whether they offer value for money in respect of quantitative analysis.

However, it should be noted that the PSC is a quantitative benchmark with inherent limitations because it requires costs and revenues to be forecast over the life of the proposed contract period.

RFP Responses will be ranked according to their risk adjusted Net Present Cost ("**NPC**") relative to the Risk Adjusted PSC. Adjustments may be made to the NPC of individual RFP Response according to their preferred risk allocation.

As considered in the *Risk Allocation and Standard Commercial Principles*, all risks to the extent not explicitly taken by government will be borne by the private party. The financial impact of the risks taken by government (e.g. Retained Risk) should be added to each RFP Response to show the total project delivery cost.

3.1.2 Qualitative and broader value for money considerations

A complete value for money assessment requires consideration of qualitative factors along with the quantitative assessment (including the infrastructure and services solution). Identifying the best outcome requires a flexible valuation process and the consideration of the qualitative factors associated with the RFP Responses that have not been explicitly valued.

Qualitative factors are discussed in further detail in the *Practitioners' Guide*.

3.2 The Reference Project

As noted above, the PSC is the estimated whole-of-life cost of delivering the Reference Project. The Reference Project represents the most efficient means of delivering the output specification. The output specification describes the range of services to be delivered and the performance requirements.

The Reference Project should:

- reflect the most likely and achievable procurement approach by the relevant department to satisfy *all* elements of the output specification if the project were to proceed on a traditionally funded basis; and

- provide the same level and quality of service as expected to be provided by bidders to enable a like-with-like comparison.

The details of, and issues associated with, the development of the output specification are examined in further detail in the *Practitioners' Guide*.

Important points to note include:

- **The reference project does not need to assume everything will be done within the public sector.** The public sector delivery method will often include elements of outsourcing or third-party contracts. For example, in the case of a hospital facilities project, the agency might decide that the reference project would consist of a turnkey contract with a builder to design and construct the building, followed by a contract with a facilities management company to provide cleaning, maintenance and other aspects of the required outputs.

- **The reference project should be based on the same scope as the PPP component of a project only.** This is particularly relevant for social infrastructure projects where core service delivery responsibility remains with government. For example, a hospital PPP contract would not include the core health services which will be provided by the public sector. Therefore, the reference project should only include the services to be provided by the private party as part of the PPP contract. Note that this does not mean the core service delivery costs should be ignored. Part of the value for money assessment includes evaluating the impact of bid solutions on any core service delivery costs.

- **Defining the reference project and constructing the PSC should be based on a project specific financial model** rather than simply undertaking a desktop analysis. An important allied point is the need to engage suitable technical advisers to develop the technical solution embodied in the Reference Project. For some projects a number of technical advisers (e.g. architect and building services) may be required. These technical advisers are also required to assist in developing the output specifications for the RFP and contract, and in assessing bids. They need to understand not only the relevant industry sector (e.g. water, health) but also the nature of PPP projects and the need for output specifications rather than input specifications. Given the relatively small pool of expertise available, these advisers should be engaged early in the process.

- **The reference project should be a realistic estimate of what efficient public provision would involve.** The reference project should be documented thoroughly. The agency must complete a detailed, documented description on how it would deliver the project if it were to be delivered publicly.This should include: which elements it would contract out; the type of contracts it would use; elements of the project which would be done in-house; and how these elements would be delivered.

3.3 Discounted cash flows

The expected cash flows of the Reference Project are discounted to give a single Net Present Cost (NPC). This allows a comparison to be made between a PSC and private sector bids (quantitative assessment) on a single cost basis. Sensitivity analysis should be performed to determine the impact on the PSC of changes in key assumptions and cash flows as outlined in Section 6.6.

The two components of the discounted cash flow model are:

- periodic estimates, incorporating cash flows from the Raw PSC, Competitive Neutrality, Transferred Risk and Retained Risk estimates; and
- the discount rate.

This document provides guidance on the creation of the financial model to incorporate both of the above factors. However, the methodology to derive an appropriate PSC discount rate is provided in *Discount Rate Methodology Guidance*.

3.4 Inflation and the PSC

The discount rate used in the PSC should generally be nominal and before income tax. The numerator cash flows should also be expressed in nominal terms (i.e. inclusive of inflation) to match the discount rate.

Nominal rather than real costs need to be considered, as the provision of infrastructure and related ancillary services over a long contractual period is typically sensitive to the effect of inflation over time. The use of nominal values also reflects accepted practice in the Australian infrastructure market.

General inflation rates should be obtained from the projections provided in the State Budget papers. Some cash flow items in the PSC may inflate at different rates from the general inflation rate. In this case, appropriate adjustments should be made to costs that are expected to increase at a different rate to the general inflation rate. Labour is an example of a cost that may inflate at a different rate from the agreed project inflation rate.

All costs and expected revenue streams should be adjusted for inflation, except where government expects to enter into contractual arrangements that would inflate at a different rate from the general inflation rate. An example of this would be if government entered into a fixed price contract for the construction of a building. In this case, the contractor would include the inflation risk within the fixed price.

The inflation rate specified in the PSC should also be incorporated into the bids, even if the bidder is expected to take financial (inflation) risk, to ensure a fair comparison of the bids against the PSC. Note that the bidder may be taking a different view on inflation, which needs to be evaluated as part of their bid. Evaluating bids against the PSC is discussed further in Section 9.

The *Discount Rate Methodology Guidance* provides further details on the methodology for determining the appropriate discount rate to be used in the evaluation of the PSC and should be read in conjunction with this *PSC Guidance*.

3.5 Non-cash items and the PSC

The PSC is calculated on a cash flow rather than an accrual basis. Given this, non-cash items, such as depreciation, should not be included in the PSC. The exception to this is where depreciation may affect tax payments, where post-tax cash flows are used, e.g. government business enterprises subject to a tax equivalent regime.

Government business enterprises subject to a tax equivalent regime are required to make tax equivalent payments to ensure they have the same taxation obligations as private sector firms. For example, although government business enterprises are ordinarily exempt from Commonwealth income taxes, they are required by their owner governments to make payments calculated on the same basis as income tax. These government business enterprises may consider using post-tax cash flows and would therefore need to adopt a post-tax discount rate.

3.6 Disclosure of the PSC

The government's position on the disclosure of PSC information should be detailed in the RFP. Generally, the Raw PSC will be disclosed unless there are justifiable (commercial) reasons for non-disclosure. As part of this, the key assumptions (financial and operating) should be disclosed. However, the timing of disclosure will be determined by individual jurisdictions on a case-by-case basis. The disclosure of the total PSC value, e.g. the Risk Adjusted PSC (either in periodic cash flow or NPC form) will be disclosed in circumstances where this is deemed to be appropriate.

3.7 Refining the PSC during the bidding process

The PSC should be finalised as part of the development of the RFP documentation and prior to RFP release.

In general, the PSC should only be refined after release of the RFP if the scope of the project changes, or it becomes apparent that a significant component has been mispriced or omitted. If a RFP Response demonstrates a more efficient delivery method than that identified by the Project Team in constructing the PSC, the PSC should *not* be changed to reflect the alternative delivery method.

Government approval is often required for any major amendments to the approved PSC after the RFP process begins.

3.8 Economic and social infrastructure

Governments are typically involved in the provision of economic and social infrastructure, either as a procurer or facilitator. The main differences between the two types of infrastructure are outlined in the Table 3-1.

Table 3-1 Differences between Economic and Social Infrastructure

Economic Infrastructure	Social Infrastructure
Revenue is sourced by the sale of goods or services directly to users, subject of market based resource allocations	Revenue is derived from government, net of any third party revenue, subject to Government resource allocation decisions
Provider faces significant market risk	Limited market risk to provider, payment streams are mainly derived from government
Infrastructure and services are usually delivered through a Government Business Enterprise (GBE) in line with national Competition Policy	Infrastructure and services are usually delivered through a government agency
Revenue risks are a key driver of financial outcome	Cost risks are a key driver of financial outcomes

The PSC should be developed on a basis that is consistent with the nature of the proposed project.

Most issues within this document are applicable to both economic and social infrastructure projects.

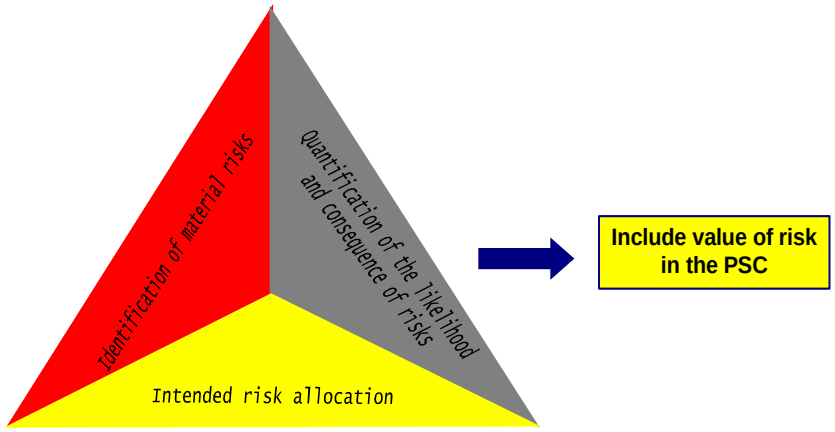
3.9 Quantifying risk

Value for money is achieved through the efficient transfer of risk to the private sector. Optimal risk management allocates risks to parties that are able to manage them.

These Guidelines recognise the importance of a sensible allocation of risks within an adequate risk management framework for the overall project. A commonsense approach is required to ensure that the PSC can be constructed in a timely and cost-effective manner.Figure 3-1 highlights the three main risk-pricing issues:

- identification of material and quantifiable risk categories;
- quantification of the consequence and probability of risk; and
- approval of the intended risk allocation.

Figure 3-1 Valuing risk



In quantifying risk, the pricing framework and assumptions used must be defensible. The party responsible for a particular risk must be capable of managing it, subject to any statutory constraints and public interest considerations.

3.10 Other items

Some other issues to clarify include:

- **Transaction costs.** Transaction costs can be significant in PPP projects. Bidders also face transaction costs which can run into millions of dollars. Although these costs are significant, they should not be included in the PSC. The PSC should only include estimated transaction costs directly relevant to government's delivery of the reference project.

  Note that while transaction costs are not included in the PSC, agencies should ensure that project funding includes cover for project transaction costs in addition to the preliminary PSC. The issue of additional transaction costs associated with the PPP process should be considered as part of the procurement decision stage of the project.

- **Sunk costs.** These are costs which have been incurred prior to the decision to proceed with the project and are not recoverable in the event that the project does not proceed. These should not be included in the PSC cash flows.

- **Efficiency gain.** In constructing the PSC, the agency should forecast costs as realistically as possible, taking into account the actual efficiency levels it expects to achieve. Having done so, the agency should not apply any further budget sector-wide general productivity savings. Achievable efficiency gains should already be captured in the agency's forecasts.

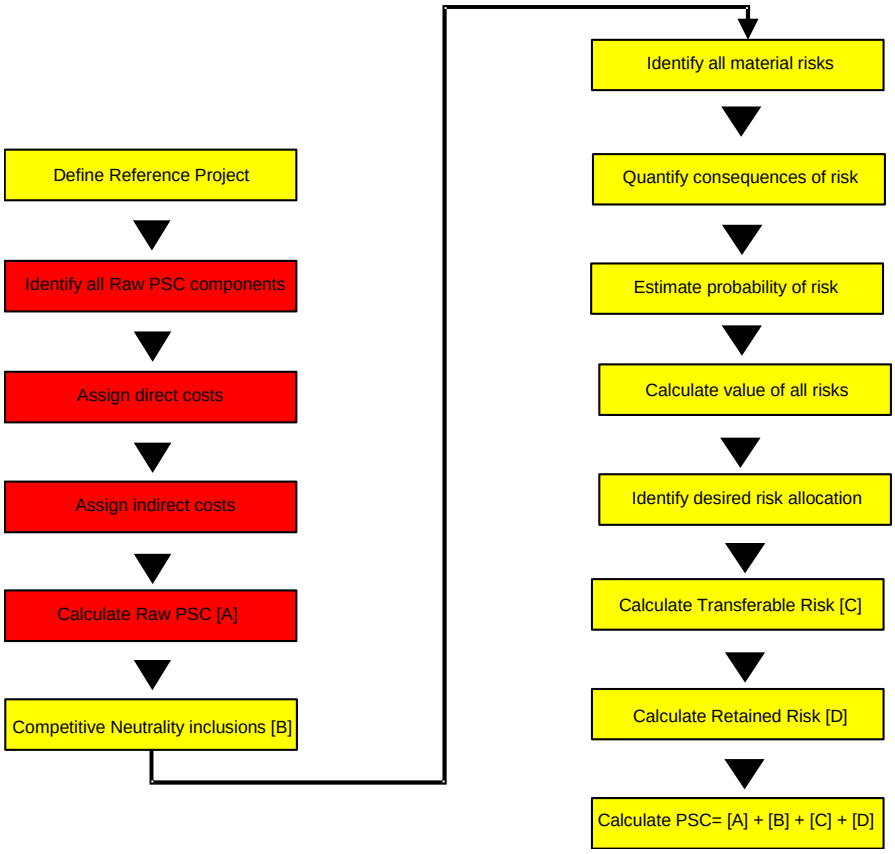
- **Residual value.** A PPP project will have a defined term – perhaps 25 years. For consistency, the PSC needs to be analysed over the same term. If facilities or equipment acquired under the project have value beyond the end of the term, and the PPP contractor is to be paid a residual value at the end of the term, this should be reflected in a 'residual value' forecast in the PSC.

4 The PSC process and the Raw PSC

4.1 Constructing a PSC

The recommended process for the development of a PSC is illustrated in Figure 4-1.

Figure 4-1 The PSC Process



The role of the Output Specification in defining the scope of a PSC is discussed below. The remainder of this section provides guidance on calculation of the Raw PSC. Sections 5 to 8 discuss the remaining components:

- Competitive Neutrality (Section 5);
- identifying and valuing risk (Section 6);
- calculating Transferred Risk (Section 7); and
- calculating Retained Risk (Section 8).

General guidance on potential valuation techniques is provided in this section and throughout this technical note. Construction of the PSC should reflect government best practice, which may evolve over time and will be updated by practice notes.

4.2 Preparing the Raw PSC

The Raw PSC includes the capital and operating costs associated with delivering the output specification over a defined period. Preparing the Raw PSC is the first step in going from the reference project to a spreadsheet model forecasting the costs and expected revenues. The Raw PSC is an estimate of the cost to government of delivering the reference project before taking into account adjustments for competitive neutrality and risk.

Preparing the Raw PSC is about preparing financial forecasts. Points to note include:

- **Only financial costs and revenues are included.** The PSC is intended as a quantitative financial benchmark against which to assess bids. Therefore, only financial costs and revenues should be included in the PSC. Economic and cost-benefit analysis form part of the investment rationale for the project and will have been considered already at the investment decision stage.

- **The PSC is a cash flow forecast.** The PSC should only include cash inflows and outgoings, not accrual items, such as depreciation and other accounting concepts. This is because the financial forecasts in the PSC will be used for project appraisal by applying the discounted cash flow (DCF) method.

  The focus on project cash flows rather than accrual and other accounting concepts has caused some confusion,. Some of the main rules to follow in this respect are:

  - ***Fixed assets.*** The PSC should include the cost of fixed assets when purchased. Depreciation should not be included in the PSC.

  - ***Maintenance.*** Actual cash expenditure on maintenance should be included in the PSC. Note that the whole-of-life maintenance cost estimates are a critical component of the Raw PSC. Appropriate technical advisers must be engaged to advise on suitable costs and phasing of works over the proposed contract term.

- **Exclude risks and contingencies from the Raw PSC.** Most items in the financial forecast cannot be predicted with certainty. Because risks are addressed separately in a later step in the process, allowances for contingencies and cost overruns should not be included in the Raw PSC.

  All forecasts in the Raw PSC should be prepared on the basis of 'everything going well'. Risks and contingencies are considered in Transferred Risk and Retained Risk adjustments to the Raw PSC.

  While the preference is to split out all contingency amounts from the raw costs and include them in the risk valuation, there will be circumstances where the Raw PSC cost estimates will include some risk contingency. In this instance, it is important to recognise what contingency amounts have been included in the Raw PSC and to ensure they are not double counted by being included in the risk component of the PSC.

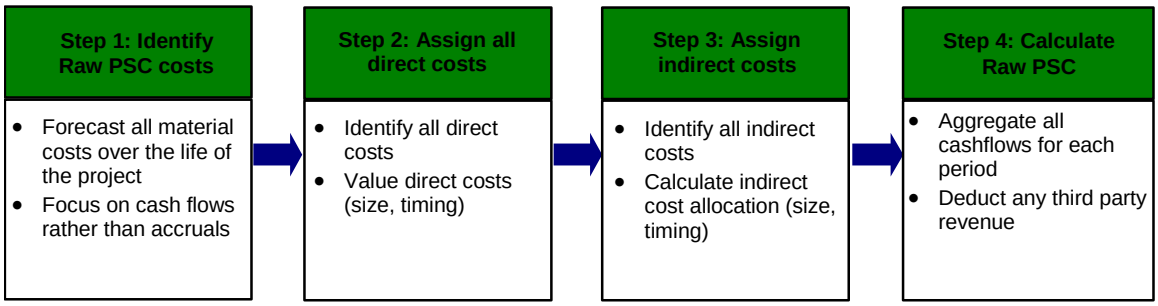
4.3 Components of the Raw PSC

The Raw PSC represents the base cost to government of producing and delivering the Reference Project. The PSC is forecast using real cash flows with an appropriate indexation to address inflation and any other relevant escalation factors. The Raw PSC comprises the following components:

- direct costs: costs that can be traced, or assigned to a particular service;
- indirect costs: other costs incurred that are not directly related to the production of the services. These are costs that contribute to the production of a service, but are not incurred exclusively for that one service; and
- less any identifiable third-party revenue.

Figure 4-2 provides an outline of the process of calculating the Raw PSC.

Figure 4-2 Steps in calculating the Raw PSC



It is important to cost the Reference Project fully when constructing a PSC so it can be evaluated on a stand-alone basis. To do this requires a comprehensive and realistic estimate and allocation of all direct and indirect costs.

Expected cash flows for the Raw PSC need to be forecast over the life of the Reference Project. Therefore, it is important to fully understand the method of delivery under the Reference Project to identify the nature and timing of all key costs.

4.4 Valuing direct costs

Direct costs are those that can be traced, or assigned to a particular service. The nature of these costs will depend on the type of service required and the method of delivery specified in the Reference Project.

4.4.1 Direct capital costs

Direct capital costs are costs that can be specifically associated with the production of any services (e.g. the procurement of the required facilities and related equipment for a road construction project). This may involve construction of a new facility, or the acquisition of an existing asset, and typically includes:

- costs incurred in designing the project;
- raw materials;
- payments to external providers (i.e. contract price);
- costs of the public procurement process (including project development, documentation and contract management);

- payments to external consultants and advisers regarding project construction (financial, legal, engineering, patronage, other); and
- plant and equipment (e.g. machinery and core IT platforms).

Note that only the costs associated with implementing the Reference Project should be included in the PSC (i.e. only those costs that the bidder would incur as part of delivering the project). Some of the relevant costs and risks that are not included in the PSC are transaction costs and contract management issues.

Capital costs should reflect best available information and prevailing best practice.

4.4.2 Capital receipts

Where the Reference Project involves the disposal of assets, the present value of the income, less any disposal cost, must be deducted from the Raw PSC (but only where the same opportunity is given to bidders).

Where ownership of the assets remains with government and the asset has a useful life longer than the term of the Reference Project, government may either dispose, or retain the assets. The PSC must, therefore, include a residual value of any assets that are not fully amortised over the term of the Reference Project.

The residual value calculation should have regard to the nature of the asset, historic residual value estimates, the expected market for the assets and the expected monetary benefit (or cost) to government if the underlying asset is retained.

4.4.3 Maintenance and lifecycle costs

Care should be taken to ensure that the level of maintenance and lifecycle costs assumed is consistent with capital costs, operating cost forecasts and residual value requirements.

Maintenance costs are generally recurrent and are associated with maintaining the capability and quality of the existing asset rather than upgrading, improving, or expanding the asset. These typically include:

- raw materials;
- tools and equipment; and
- labour required for maintenance (wages and salaries).

Timing of the cash flows is an important issue in determining capital and maintenance costs. In general, a trade-off exists between capital and maintenance costs. For example, a high residual value allocation may require higher through-life maintenance to maintain the economic life of the underlying asset. Alternatively, low levels of maintenance may require earlier and potentially larger capital upgrades. The following factors should be considered when determining capital and maintenance costs:

- upfront capital costs;
- periodic maintenance requirements (this may be influenced by the nature and quality of the asset provided);
- capital improvements and upgrade to existing facilities; and
- capital expenditure on additional facilities (expansion), if part of the Reference Project.

4.4.4 Direct operating costs

Direct operating costs are associated with the daily operation of the infrastructure and related services. These costs specifically refer to those services which will be provided directly by the private sector.

Direct operating costs typically include the following:

- cost of inputs;
- employees directly involved in the service provision:
  - wages and salaries;
  - employee entitlements;
  - superannuation;
  - employee insurance;
  - training and development;
  - annual leave, long-service leave, expected redundancy payments;
  - travel;
- direct management costs; and
- insurance.

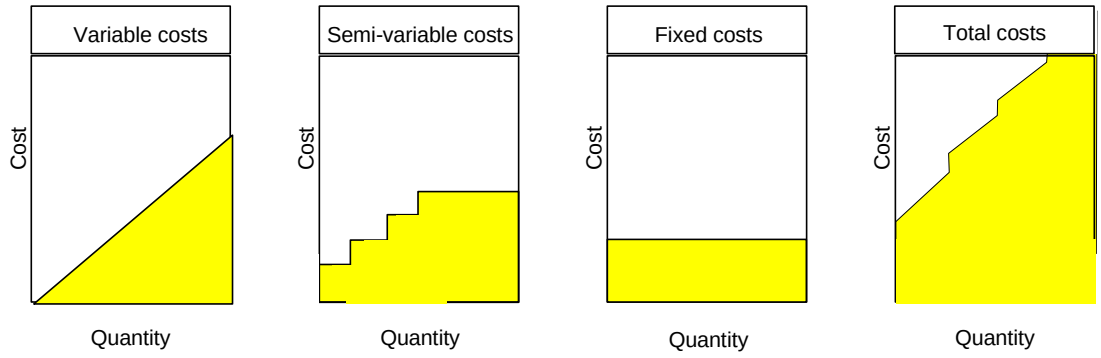
The calculation should have regard to historical cost information, subject to discussion with industry practitioners to ascertain whether operating practice has changed (e.g. technology developments).

Section 7 (Calculating Transferred Risk) and Section 8 (Calculating Retained Risk) provide further discussion on the treatment of insurance.

4.4.5 Fixed, variable and semi-variable costs

When forecasting future operating costs, it is useful to distinguish between fixed, variable and semi-variable costs. Figure 4-3 illustrates the relationship between total cost and unit service cost.

Figure 4-3 Operating cost components



Fixed costs are, in the short term, independent of the volume of services delivered. For example, in the provision of water treatment services, this may typically include lease charges on the required land.

The volume of services delivered drives variable costs. In the previous example this may include the cost of chemicals and agents in the water treatment process.

Semi-variable costs only increase after a threshold increase in the level of services has been reached and, as seen in Figure 4-3, will usually then taper off. In the provision of water

treatment services example, this may include treatment filters, since higher water volume throughput may lead to greater filter usage.

The proportion of variable to total costs will influence also the sensitivity of the PSC to changes in operating assumptions. Section 6.6 discusses sensitivity analysis.

Forecasts of the expected direct operating costs in the Raw PSC should also reflect reasonably foreseeable improvements in service delivery or efficiency savings. This may be influenced by:

- increased efficiency, or familiarity with new service, or production techniques;
- economies of scale — if services are increased over the life of the Reference Project, or synergy is likely through integration with other infrastructure (ability to spread fixed costs over multiple product/project offering); and
- declining market cost of inputs (e.g. IT equipment).

For example, the types of direct costs that might be included in a typical accommodation services project are:

- direct capital costs:
  - buildings;
  - refurbishment;
  - furniture; and
- direct operating costs:
  - council rates; and
  - building services.

4.5 Applicable indirect costs

Indirect costs are other costs incurred that are not directly related to the provision of services. They include:

- operating costs:
  - corporate overheads:
    - ancillary running costs (e.g. power, cleaning, stationery);
    - non-core IT and equipment (e.g. used for administration);
  - administrative overheads:
    - employees not directly involved in the service provision;
    - facilities management;
    - overall project management;
- capital costs:
  - partial commitment of plant and equipment; and
  - partial usage of new administration buildings.

Indirect costs can be allocated using two broad methods:

1 traditional indirect cost allocation method

This involves considering the extent to which the indirect cost contributes to, or was caused by, the services. Whatever is identified as driving the cost is then used as the basis for allocating indirect costs to the services. For example, a cost driver for allocating accommodation rental costs would be the ratio of floor space (in square metres) occupied by each person, or work group to the total floor space.

2 activity-based costing method

Under this method, the activities that comprise the production process culminate in the delivery of services. Activity-based costing examines the activities undertaken within an organisation, determines why they are used in the production process, and then assigns costs to services according to the consumption of each activity in the production of the services. Each activity is costed on the basis of the resources consumed.

4.6 Third-party revenue and the PSC

Expected third-party revenue over the life of the Reference Project reduces the net cost to government and should be deducted from total operating costs in the Raw PSC. Third-party revenue may be generated where:

- third-party demand exists for the infrastructure or related services;
- service capacity exists above government requirements; and
- government allows third-party utilisation.

Raw PSC = (operating costs – third-party revenue) + capital costs

When forecasting likely third-party revenue, regard must be given to government and community requirements over the life of the Reference Project. Equally the costs and risks associated with third-party revenue need to be considered.

The expected third-party revenue should be adjusted in the Transferred Risk component by cash flow deductions that equate to the probability that third-party receipts may be different from the level forecast in the Raw PSC.

The time and resources employed should reflect the materiality and reliability of the amounts involved. Consideration should also be given to the following sources:

- applicable government policy, or guidance relating to fees and charges payable by third-party users; and
- historical demand and prices charged for the same, or similar services.

4.7 Calculate Raw PSC

The Raw PSC is calculated as follows and based on the inputs determined as above:

Raw PSC = (operating costs – third-party revenue) + capital costs

5 Competitive Neutrality

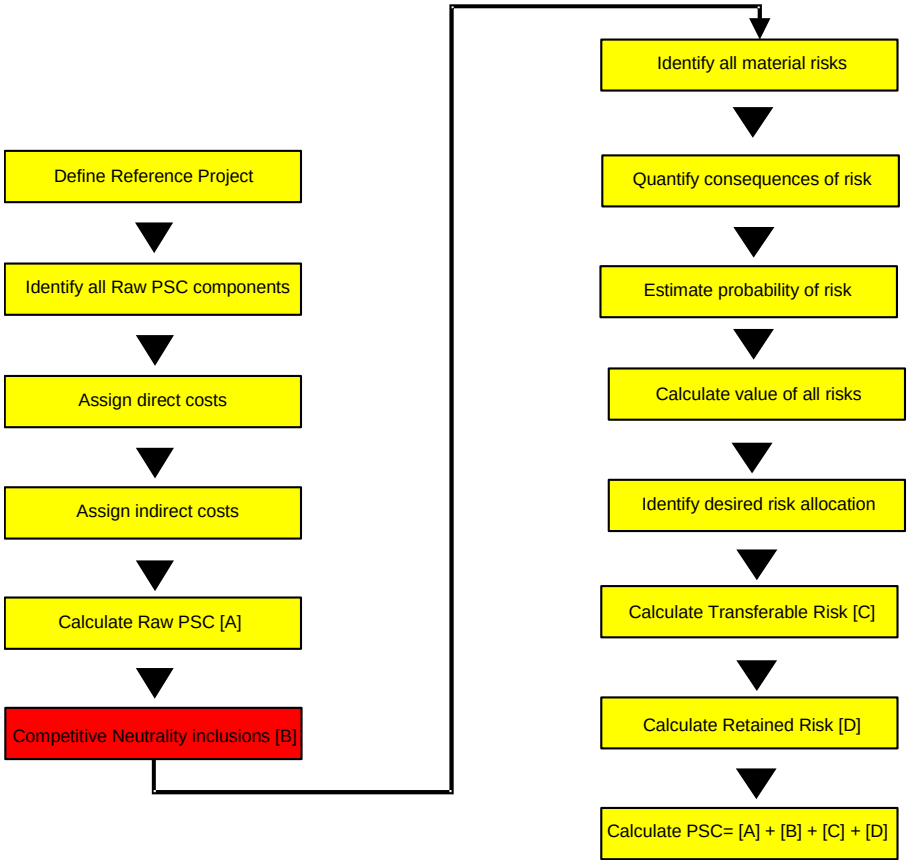
5.1 What is Competitive Neutrality?

Competitive Neutrality removes the net competitive advantages that accrue to a government business by virtue of its public sector ownership. This allows a like-with-like value for money assessment between a PSC and private bids, by removing the effects of public ownership and including equivalent costs that would otherwise be incurred.

Competitive advantages from public sector ownership typically include taxes, such as land tax, that are only levied on private enterprises. Competitive disadvantages may also arise from public sector ownership and these are typically heightened public scrutiny and reporting requirements not faced by a private enterprise.

Figure 5-1 illustrates the role of Competitive Neutrality in the construction of a PSC.

Figure 5-1 The PSC process and Competitive Neutrality

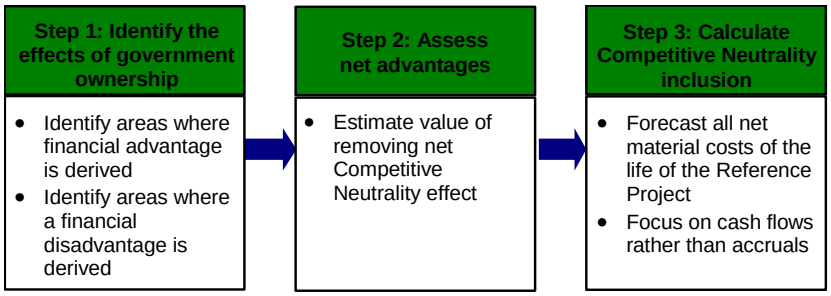


5.2 Valuing Competitive Neutrality

Competitive Neutrality only includes advantages that accrue to a government business which are not equally available to a bidder. It does not include differences in performance or efficiencies that arise in a competitive market and should be distinguished from differences in cost levels between the public and private sector. An example of competitive neutrality is land tax that is payable by the private sector, but would not otherwise be incurred by government.

Figure 5-2 provides an outline of the process in calculating Competitive Neutrality in a PSC.

Figure 5-2 Steps in calculating Competitive Neutrality



The PSC is a cash flow calculation and thus Competitive Neutrality inclusions should be based on cash flow adjustments, rather than on an accruals basis. Non-cash adjustments, such as depreciation, therefore would not form part of Competitive Neutrality.

Table 5-1 outlines some of the potential cost advantages and disadvantages that may apply to government businesses and how to adjust the PSC for such changes.

Table 5-1 Potential government advantages/disadvantages and PSC adjustments

Potential advantage	Cost treatment
No requirement to cover the cost of capital	• Use of an appropriate cost of capital to discount periodic cash flows
Land tax exemption	• Determine whether the land required for the Reference Project would be subject to land tax, if acquired by a bidder • Quantify the amount of land tax a bidder would incur • If calculation of full costs includes an estimation of commercial rent, no adjustment needs to be made
Local government rates exemption	• Determine whether the premises required for the Reference Project would be subject to local government rates if acquired by a bidder • Quantify the amount of local government rates that a bidder would incur • The cash flow timing should correspond with the periodic obligation to pay the rates • If calculation of full costs includes an estimation of commercial rent, no adjustment needs to be made
Stamp duties exemption	• Determine whether a government exemption would exist under the Reference Project • Identify transactions associated with the Reference Project that would be dutiable but for the government exemption • If a duty would not otherwise be payable, calculate the implied duty applicable for relevant transactions

Potential advantage	Cost treatment
Payroll tax	• Quantify the amount and timing of payroll tax that a bidder would incur if it had the payroll tax expense that the public sector expects to incur on the Reference Project
Corporate overheads	• Calculate the cost of obtaining the 'free' corporate overheads, including payroll services, human resource services, office accommodation, marketing and IT services

Competitive Neutrality costs need to be identified and included throughout the term of the Reference Project. This includes recurrent costs (e.g. local council rates) and costs that arise through specific transactions over the life of the Reference Project (e.g. stamp duty).

5.3 The need for Competitive Neutrality inclusions

Competitive Neutrality inclusions generally fall into one of two categories:

- differences in state taxation obligations faced by virtue of public sector ownership; and
- differences in state regulatory costs imposed by virtue of public sector ownership.

5.3.1 Treatment of taxation

State taxes are an additional cost to bidders that government may not incur under the Reference Project. To the extent these are additional costs not borne by the government agency, an equivalent cost needs to be imputed in the PSC.

Taxes to be included in the PSC may typically include the following:

- land tax;
- local council rates;
- payroll tax; and
- stamp duties.

These amounts are added to the PSC, as government exemption represents an advantage to the Reference Project. The number and type of costs that are included should reflect their likely material impact on the PSC. Commonwealth taxes are excluded from the Competitive Neutrality inclusions as the net cash flows to Government are compared on a pre Commonwealth income tax basis.

Competitive Neutrality inclusions only arise if there is no actual tax, or tax equivalent obligation under the Reference Project.

5.3.2 Treatment of regulation

Competitive Neutrality inclusions may also arise where the Reference Project is exempt from complying with legislation, regulation or other material requirements, which the bidders must satisfy (e.g. building permits). The inclusion is measured as the costs of compliance to the same standard as required by the bidders. A similar valuation process is used where a government business activity faces additional material regulatory requirements (e.g. reporting) to which the bidders are not subjected. In this case, the Competitive Neutrality adjustment is a deduction to the PSC, not an addition.

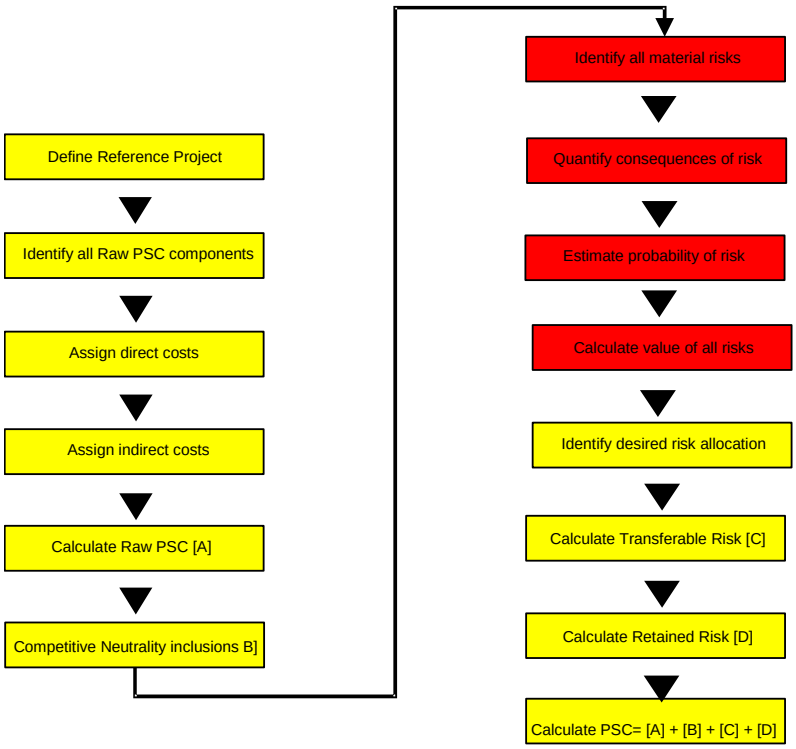
6 Identifying and valuing risk

6.1 Why value risk?

Risk is an inherent part of any project. For the PSC to provide a meaningful test for value for money against the private bids, it must include a comprehensive and realistic pricing of all quantifiable and material risks. It is important to keep in mind that the PSC reference project should be defined and costed to provide the same level and quality of service expected of the private sector. Consequently, risks associated with the delivery of services to these required standards need to be priced in the PSC to the extent practicable. The inclusion of a valuation for risk in the PSC forms part of the broader process of risk identification, allocation and management within *Infrastructure Australia*.

Figure 6-1 illustrates the process of valuing risk and its role in the construction of a PSC. This section provides guidance on the general valuation of risk. This forms the framework for the valuation of both Transferred and Retained Risks which are covered in Sections 7 and 8 respectively.

Figure 6-1 The PSC process: valuing risk



6.2 The method for valuing risk

The value given to a risk in a PSC measures the expected cost of that risk to government if the project were delivered under a public procurement. Once all material risks have been identified and valued, they can then be classified between Transferred and Retained Risks, depending on which of those risks government would allocate to the bidder (Transferred Risks), or which risks government would retain (Retained Risks). These concepts and specifically the risk allocation framework are explored further in both the *Practitioners' Guide* and *Risk Allocation and Standard Commercial Principles*.

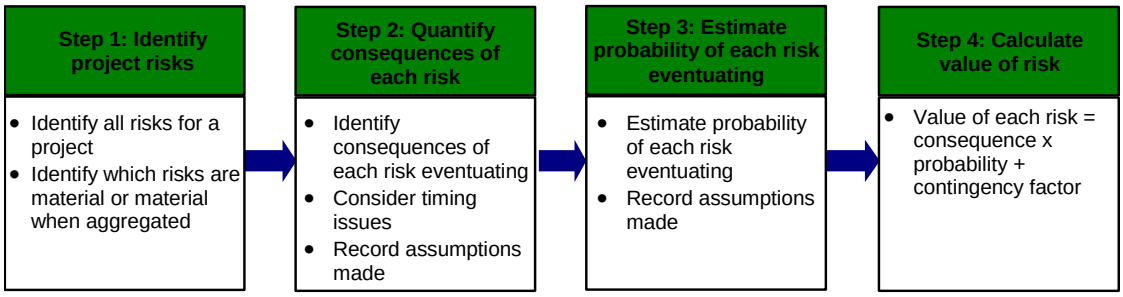
There are a number of conceptual and statistical methods that can be used to value risk. Broadly, risk can be included in the PSC through one of the following methods:

- including the costs of project specific risk in the cash flow numerator; or
- adjusting the discount rate (cost of capital) to reflect the specific level of risk for each project.

These Guidelines advocate valuing risk in the cash flow numerator of the PSC. The methodology for the determination of the discount rate is provided in *Discount Rate Guidance*.

The process of valuing risk can be summarised as shown in Figure 6-2.

Figure 6-2 Steps in valuing risk



The valuation method and level of resources used in valuing risk should reflect a commonsense approach, so that it can be developed and delivered by the procurement team in a timely and efficient manner. This should include a consideration of the expected materiality of the risk to the project, time involved and the costs and resources required to value particular risks. Where appropriate, experienced risk valuation professionals may help to reliably assess the value of risk in a cost-effective and timely manner. This expertise may exist within government, or may be engaged externally.

6.3 Identifying project risks

Identifying (and quantifying) projects risks can be a complex and laborious exercise. Experience suggests that workshopping can greatly assist the process. The workshop is usually led by an experienced practitioner and should at least initially include the widest representation of the project team. Participants must be encouraged to 'brainstorm' so that all potential risks are identified. Many of these risks may be ranked eventually as immaterial but is nevertheless essential that the project team endeavours to identify *all* project risks.

It is not necessary to quantify the impact of particular risks during the identification phase. The identification process is sufficiently complex without the added complexity of numerical quantification. To assist the quantification of risk in the next stage, the project team should make an assessment of:

- the likelihood of the risk occurring; and
- the consequence, or impact of the risk if it did occur.

Once all risks have been identified and recorded, the likelihood and consequence of the risk occurring should be recorded and ranked in a simple matrix.

Figure 6-3 provides an example of a matrix which demonstrates the identification of risks by likelihood and consequence:

Figure 6-3 Example Risk Matrix

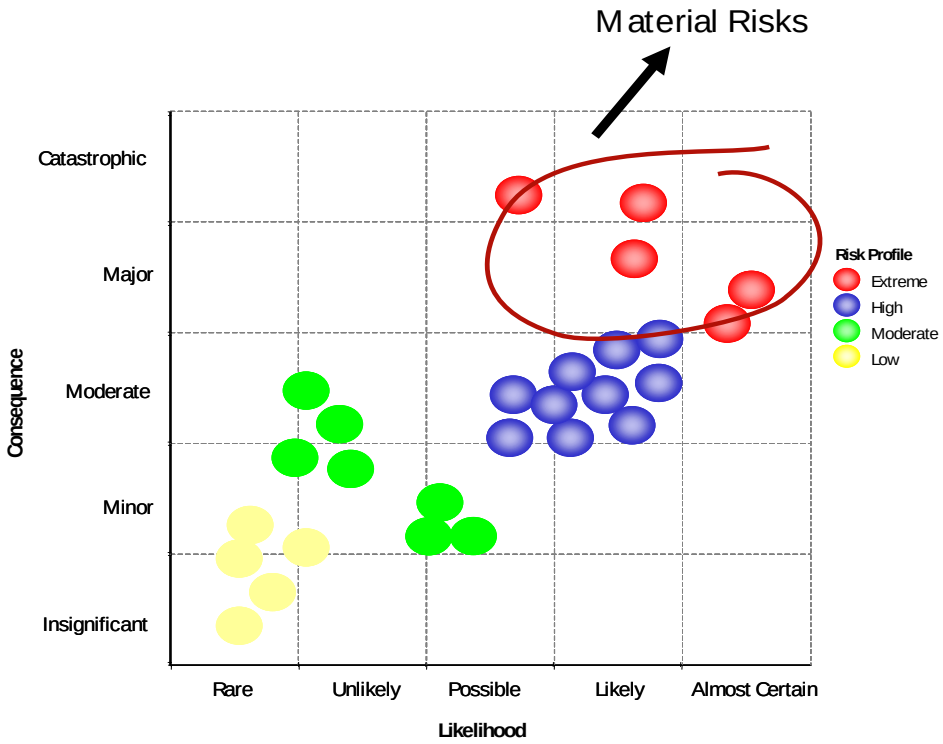


Table 6-1 provides a general description of the main categories of risks likely to be encountered in most PPP projects.

Table 6-1 Risk identification

Risk	Description
Site Risk	This includes the risk that the project land will be unavailable, or unable to be used at the required time, or in the manner or the cost anticipated, or the site will generate unanticipated liabilities.
Design, construction and commissioning risk	Design, construction and commissioning risk is the risk that the design, construction or commissioning of the facility (or certain elements of those processes) is carried out in a way that results in adverse consequences on cost and/or service delivery.

Risk	Description
Sponsor risk	In establishing a project Consortium, the sponsor typically establishes the private party in the form of a special purpose vehicle ("SPV"), which contracts with government. The SPV is simply an entity created to act as the legal entity of a project Consortium. Because the arrangement is financed through non or limited recourse debt, creditors have access to the project's cash flows but limited recourse to the sponsors' balance sheets. Sponsor risk is the risk taken by government that the SPV, or its sub-contractors, will not fulfil their contractual obligations.
Financial risk	This includes the risk that private finance will not be available, the project will not prove financially robust, or changes in financial parameters will alter the bid price before financial close.
Hard and soft facility maintenance operations risk and the payment mechanism	This includes the risk that payments made for services during the service period are abated because of performance incidents, and is typically reflected in both the contractual provisions and the payment mechanism. The larger the size of hard and soft facility maintenance service packages, the more effective is the payment mechanism in influencing service performance.
Market Risk	This includes the risk that demand for a service will vary from that initially projected, or that the price for a service will vary from that initially projected, so that the total revenue derived from the project over the project term will vary from initial expectations.
Network and interface risk	This arises where the contracted services, or method of delivery of those services are linked to, rely on, or are otherwise affected by certain infrastructure, inputs and other services, or methods of delivering the contracted services. Interface risk is the risk that the contracted services will not be compatible with the delivery of Core Services.
Industrial relations risk	This is the risk that industrial action impacts on the performance under the contractual obligations.
Legislative and government policy risk	This is the risk that government will exercise its powers and immunities, including but not limited to the power to legislate and determine policy, in a way which negatively impacts, or disadvantages the project.
Force majeure risk	This refers to the risk that events may occur which will have a catastrophic effect on either party's ability to perform its obligations under the contract.
Asset ownership risk	This includes the risk of maintaining the asset to the requisite standard (including the risk that the cost of maintenance may increase during the term), the risk of premature obsolescence, or that the construction of competing facilities will occur.
Tax risk	This is the risk that changes in the taxation framework may impact on the financial assumptions of the project.
Interest rate risk	This is the risk of adverse interest rate movements.

Further guidance on identifying project risks is provided in *Risk Allocation and Standard Commercial Principles*.

The depth and accuracy of information collected should reflect the materiality of the costs (or revenues) to be quantified. It would generally be inappropriate to devote excessive time and resources to valuing minor, or less sensitive risks.

In addition, there are often a number of risks that may exist, but are unlikely to have any real economic effect on the project being considered. For valuation purposes, only *material risks* need to be included in a PSC.

The valuation process may be simplified sometimes by aggregating risks into a smaller number of categories according to their likely impact. This may be particularly useful where:

- individual risks are likely to be immaterial, but are material when aggregated;
- quantification is difficult for individual risks;
- risks are influenced by common factors; or
- considerable interaction exists between individual risks.

Care should be taken to not double count risks where identified risks are merely subsets of the main risk identified. Again, the reasons for aggregating individual risks should be documented.

Every effort should be made to identify and quantify all material risks for a project. If a risk is unquantifiable, it should still be identified and included in the list of risks for each project, together with the reasons for exclusion from the PSC. This will help maintain attention on non-pricing aspects of the risk. The possible impact of these risks may be relevant also in writing specifications for the tender process and then as part of the qualitative evaluation of private bids. Section 9.4 discusses qualitative evaluation issues further.

6.4 Identify all material risks and quantify consequences of risk

Once all material risks have been identified, the procurement team will need to assess and quantify the possible consequences of each risk eventuating, including the effect of any timing issues. This requires a thorough understanding of all areas of the project.

There should be an attempt to value all material risks, even those that at first appear difficult to quantify. Nevertheless, a flexible approach to the number of risks and the valuation methods used is required. Primary effort should go into valuing the more important risks (the Pareto or 80/20 rule). Where there is insufficient data to value a risk, commonsense approximations may be used. However, if a risk cannot be sensibly quantified, its exclusion from the PSC should be noted and become part of the qualitative assessment.

The project team should also make a preliminary assessment of the relationships between the identified risks. Risks that are not mutually independent should be noted as potentially correlated with other risks.

The project team should also identify the risks that it expects will be retained by the public sector and those that may be transferred or shared. Each material risk should be identifiable in the risk-adjusted costing in the financial model for the PSC.

Assessing the timing of the cash flows associated with each risk is particularly important for two reasons. First, the impact of inflation needs to be considered. Second, different risks typically have a different cost/time profile over the term of a project. For example, the financial impact of construction risks are generally limited to the pre-completion period and the early years of the project; operating, demand or maintenance risks are relevant over the entire term of the project (following completion); residual value risk is limited to the end of the term of the project or to an assumed disposal date.

The consequence of risk measures the difference between the base cost (or revenue) in the Raw PSC and the expected outcome if the risk eventuates. As noted in Section 3, the Raw PSC should not include any value for project risks that may directly affect cash flows, such as contingencies.

A specific issue that needs to be considered is the consequence of insurance in terms of mitigating risks to the project. Further information on this is provided in Section 7.3.

6.4.1 Direct and indirect consequences of risk

The consequences of risk can be either direct or indirect. Direct consequences include time and cost overruns over the initial base costs used in the Raw PSC. Indirect consequences arise from the interaction between risks, where the occurrence of one risk has flow-on implications for other aspects of the project. When identifying the consequences of a particular risk, the potential interaction between risks needs to be considered. This is particularly relevant where the risk would delay the critical path and has a flow-on effect throughout the project.

For example, when considering construction risk, the possible flow-on effects, or indirect consequences, could include:

- the cost to government of maintaining existing (and often more expensive) infrastructure or services;
- increased operating and management costs; and
- increased maintenance costs over the term of the project if the cost of key raw materials unexpectedly increases (focus on whole-of-life costing).

Generally, all these costs should be included in the cost of the underlying risk that causes the interaction. However, care should be taken to avoid double counting. This may arise where a risk would be transferred under a public procurement, for example, design and construction risks under a fixed price or turnkey contract and flow-on effects under liquidated damages provisions. In this case, if these risks are included in the contract price specified in the Raw PSC, they should not be double counted by inclusion in the risk components of the PSC. Table 6-2 provides a list of typical direct consequences of particular risks.

Table 6-2 Direct consequences of risk

Risk category	Direct consequence
Commissioning risk	Additional ramp-up costs, cost of maintaining existing infrastructure or providing a temporary alternative solution where this leads to a delay in the provision of the service
Construction risk	Additional raw materials and labour costs, cost of maintaining existing infrastructure or providing a temporary alternative solution where this leads to a delay in the provision of the service
Demand (usage) risk	Reduced revenue based on lower throughput
Design risk	Cost of modification, redesign costs
Environmental risk	Additional costs incurred to rectify an adverse environmental impact on the project, incurred from the construction or operation of the project or pre-existing environmental contamination

Risk category	Direct consequence
Financial risk	Additional funding costs for increased margins or unexpected refinancing costs
Force majeure risk	Additional costs to rectify
Industrial relations risk	Increased employee costs, lost revenue or additional expenditure during delay in construction or service provision (post-construction)
Latent defect risk	Cost of new equipment or modification to existing infrastructure
Operating risk	Increased operating costs or reduced revenue over the project term
Performance risk	Cost of failing to comply with performance standards
Change in law risk	Cost of complying with new regulations
Residual value risk	Lower realisable value for underlying assets at end of project term
Technology obsolescence risk	Cost of replacement technology
Upgrade risk	Additional capital costs required to maintain specified service above the level included in the Raw PSC
Maintenance risk	Increased cost of repairs above the level included in the Raw PSC

Note that the consequences associated with a particular risk may also change over time. For example, the consequences of technology risk are likely to increase over time due to technical obsolescence, but also will be influenced by the cyclical replacement of equipment (e.g. where software is updated, or replacement equipment is installed). Further, the replacement cost of equipment may change over time.

A useful tool for identifying the consequences and financial impact of risk is a risk matrix. A comprehensive risk matrix should be more than an indication of whether each risk should be transferred, retained or shared. It should also identify the main consequences, financial impact and potential mitigation strategies for each risk. This allows the risk matrix to serve as a reference point for valuing risk in a PSC.

It is useful to separate the different causes and consequences of each risk for two reasons:

- different consequences may have a different probability of eventuating — typically, more severe consequences have a lower probability of occurring; and

- it may be optimal to allocate different causes for the same risk between the parties, based on their ability to manage it at least cost.

This process is performed for each risk to complete the risk matrix. The entire process should be thoroughly documented to ensure an adequate probity trail exists to justify the risk valuation and allocation, and to allow for future review of the process. *Risk Allocation and Standard Commercial Principles* should be referred to for guidance on the development of a risk matrix.

6.5 Estimate the probability of risk

Having identified the material risks and assessed the variety of potential consequences, it is then necessary to estimate the probability of each of the consequences occurring. When assessing a particular risk, the procurement team should consider whether probability is expected to change over time. For example, the probability of operating cost over runs may typically change over the term of the project, due to the reduced ability to forecast accurately over the long term. There are various risk valuation techniques that can be used to provide probability estimates. These range from simple techniques that provide a subjective estimate of probability, to more advanced techniques that produce weighted probabilities for specific risks based on given confidence intervals, and single comprehensive risk estimates for all project risks using multivariable statistical techniques.

Some of these techniques are outlined below, with guidance on which method may be suitable for each risk.

6.5.1 Simple probability valuation techniques

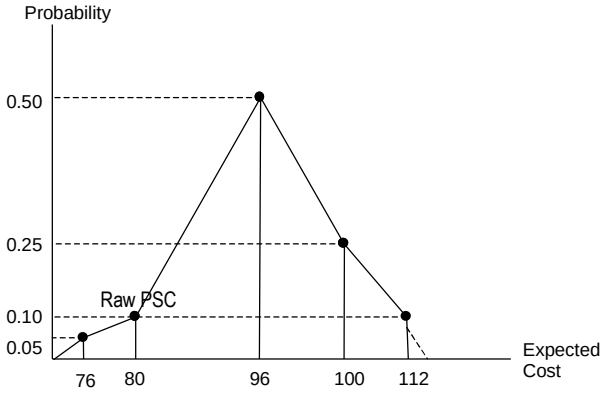
The most simple risk valuation technique is a subjective assessment of probability for each risk. This approach has the advantage that it is easier to construct and interpret than advanced statistical methods.

Subjective assessments should, where possible, be based on past experience, current best practice and likely improvements in the future, supported by reliable information where available. Typically this will involve analysis of the same information used to identify the consequences of risk to observe the extent and frequency of time and cost overruns in previous similar projects.

One of these techniques is the point estimate approach. Practitioners should *realistically* assess how likely final costs are to be above, or below the amount included in the Raw PSC. The number of point estimates used in valuing risk (each having a different expected consequence) should reflect the materiality of the risk and the information available.

Figure 6-4 illustrates the point estimate approach for the construction risk associated with a hypothetical water treatment plant, presented as a simple probability distribution.

Figure 6-4 Hypothetical probability distribution (point estimate approach)



Example 1 provides a simple example using a point estimate approach.

Example 1 Construction risk (simple case)

Consider the construction of a water treatment plant with a base NPC capital cost of $80 million (this is the amount included in the Raw PSC) over a two-year construction period. Evidence in similar public procurement projects suggests that there is only a 10 per cent probability that actual construction costs (including both cost and time overrun) will be the same as the initial base amount included in the Raw PSC (a risk consequence of $0.0 million), while the most likely outcome is expected to exceed the initial base amount by around 20 per cent (a 'likely' over run of $16 million). It is also estimated that there is a further risk of a 25 per cent increase (a 'moderate' over run of $20 million), and a smaller risk that costs will increase by up to 40 per cent (an 'extreme' over run of $32 million). In addition, there is a further possibility that costs may actually be 5 per cent below the base amount (a consequence of $-4.0 million, representing the potential *reduction* in cost). This can be summarised into the following table (assume the probabilities are given — estimating the probability of the consequence of risk occurring is covered in Section 6.5).

Scenario	Outcome ($m)	Consequence ($m)	Probability	Value of risk ($m)
Below the base amount	76.0	-4.0	0.05	-0.2
No overrun	80.0	0.0	0.10	0.0
Overrun: likely	96.0	16.0	0.50	8.0
Overrun: moderate	100.0	20.0	0.25	5.0
Overrun: extreme	112.0	32.0	0.10	3.2
				Total: 16.0

When assessing the consequence of risk, the expected timing of the cash flows also needs to be considered (a) to account for the effect of the discount rate, and (b) to convert to nominal cash flows (to include the effect of inflation).

The timing of the impact of construction risk generally occurs during and slightly after the construction period, depending on the likelihood of time over runs. If 70 per cent of the risk (valued above) is assumed to be expected during initial construction in Year 0, with the remaining 30 per cent in Year 1, the cash flows associated with the risk could be represented as follows (note for simplicity this assumes all cash flows occur at the beginning of the period):

Example 1 (cont.)

Cost	Year 0 ($m)	Year 1 ($m)
Construction risk		
Real cost	11.2	4.8
Nominal cost	*11.2*	*4.9*
(assume inflation @ 2.5% p.a.)		
Discount factor (assume discount rate @ 8.65% p.a.)		
	1.00	1.09
Discounted cash flows	*11.2*	*4.5*
Present value	**15.7**	

The present value of construction risk in this example would be $15.7 million, equivalent to approximately 19.7 per cent of the construction cost included in the Raw PSC.

6.5.2 Advanced probability valuation techniques

Statistical techniques can be used to estimate the probability of risk by constructing probability distributions and interpreting the resulting outputs. These distributions are based on professional experience, supported where available by historical information and reliable assumptions for similar recent projects. Once these distributions have been calculated, a reliable estimate of probability can then be made to a given level of accuracy (known as the confidence interval).

Statistical risk measures have the advantage that they are based on rigorous economic principles, use a mix of professional experience and available information, and map a variety of possible outcomes. The accuracy and reliability of probability distribution estimates depends on the capability to provide reasonable forecasts of likely outcomes, supported by the quality of available information.

Instead of estimating each risk and its components separately, it may be possible to calculate a single risk measure through multivariable analysis and simulation. These techniques typically involve the use of computer-based simulation packages.

One accepted method of multivariable analysis is Monte Carlo simulation. This technique constructs an artificial probability distribution for total risk, or a subset of risks, based on assumed, or actual distributions for each of the individual risks. It then provides a single value for risk by simultaneously solving a number of different risk relationships.

In order for a meaningful Monte Carlo simulation to be performed, a sufficient data set should be available to allow assumptions to be made about the distribution of each risk variable. This may be possible when sufficient information exists to allow the construction of a multivariable equation, or through the engaging of a technical expert with experience in similar projects.

Where advanced probability valuation techniques and Monte Carlo, or other simulation techniques are used, it is generally helpful to employ technical experts, or external advisers with particular expertise to determine appropriate probability distributions, provide reliable probability estimates and perform the probability analysis and econometric assessment of the results.

6.5.3 Determining the most appropriate valuation technique

This technical note explains and provides examples of the use of a simple and advanced probability valuation technique. The technique that is adopted for a particular project, or a particular risk depends on the significance of the project and the complexity of the risks within it.

When selecting a risk valuation technique, other factors to be considered besides the significance of the particular risk within the project are:

- size of the project — the greater the size the greater the likelihood of using an advanced probability technique;
- complexity of project — the more complex, the greater the likelihood of using an advanced probability technique;
- cost benefit analysis — the cost of using the technique (time taken plus cost of external consultants) should be evaluated against the potential value of the risk; and
- bids close to the PSC — where the NPC of a bid is close to the PSC, more complex valuation techniques such as Monte Carlo simulations may assist in ranking the bids by increasing the accuracy of the bid evaluation process.

6.6 Sensitivity analysis

Sensitivity analysis should be performed on key cash flows and assumptions to determine the robustness of the PSC to potential changes in assumptions, risk components and the forecast operating environment over the term of the project. Sensitivity analysis can be used for the following purposes:

- comparison with bids to identify the changes in base assumptions which would result in a different evaluation decision being reached; and
- determine the relative robustness of the PSC to bids. This may be assessed as a qualitative factor if the PSC is close to the lowest bid.

Assumptions across a variety of key variables should be examined as part of a sensitivity analysis. The procurement team should also consider whether, for example, an increase in a base cost assumption (in the Raw PSC) would lower an associated risk. For example, if a sensitivity analysis considered the effect of an additional 10 per cent increase in the base capital costs of a project (reflected in the Raw PSC), the value of design and construction risk may be lower.

Sensitivities can be performed by varying individual assumptions, or by considering simultaneous changes in a number of variables. This allows both the impact of key factors to be considered, as well as examining a range of realistic scenarios where there is considerable interaction between variables. This may already be implicitly considered in the PSC where Monte Carlo simulation has been used to value risk. As a general rule, the amount of sensitivity analysis performed should reflect the materiality of key variables, the complexity of the PSC and the proximity of the PSC to the lowest cost bid.

Variables that are typically analysed using sensitivity analysis include:

- length of the project (both the construction and concession periods);
- periodic inflation rate;
- construction costs, schedule and completion dates (both in the Raw PSC and the pricing of risk);
- total service demand;
- total operating costs;
- third-party revenue; and
- residual value.

Where possible, the financial model should be developed to allow different values for key variables over time.

7 Calculating Transferred Risk

After identifying and valuing all material risks, each risk should be identified as either a Transferred or Retained Risk, depending on whether it should be transferred to the bidder, or retained by government under the contractual arrangements of the PPP.

Some risks may not be fully transferred to the private sector, or fully retained by government, but may be shared to varying degrees between the private sector and government. The extent of risk sharing will be dependent on the nature of the risk and party specific circumstances (and as such, allocated on an appropriate basis between transferred and retained).

The concept of transferring risk to the private sector implies that the risk initially lies with government. In this context, the concept of risk retained by government (Retained Risk) is also relevant to the construction of the PSC. However, in *Risk Allocation and Standard Commercial Principles,* the starting premise is that the private party assumes all associated project risk, except the risk that is expressly taken back by government.

These two approaches are not inconsistent. They merely reflect the use of different points of reference.

7.1 Defining Transferred Risk

Transferred Risks are those that are likely to be transferred to the private sector under the PPP arrangement. The type and number of risks which are classified as Transferred Risks needs to be assessed on a project by project basis.

The value of Transferred Risk in a PSC measures the cost government would expect to pay for that risk over the term of the Reference Project.

Figure 7-1 illustrates the role of Transferred Risk in the construction of a PSC.

Figure 7-1 The PSC process: Transferred Risk

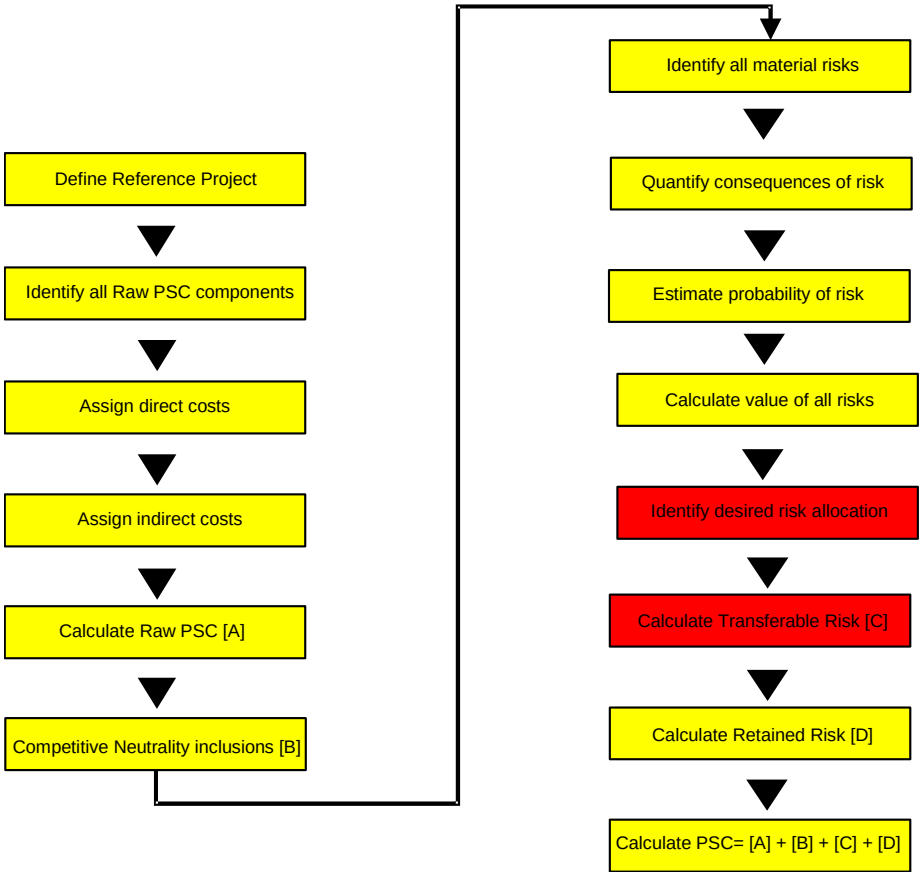
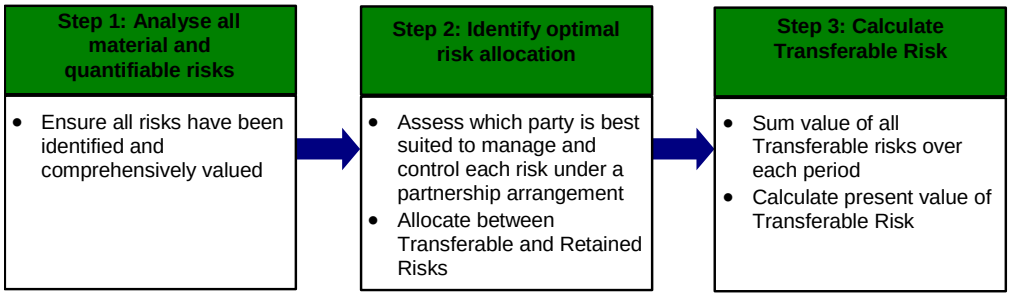


Figure 7-2 Steps in valuing Transferred Risk



Step 1 (Analyse all material and quantifiable risks) is dealt with in Section 6 and builds on the general risk valuation guidance provided in that section. Again, it should be emphasised that all material risks need to be identified and valued before considering allocation issues. Practitioners are encouraged to revisit Section 7 as required to supplement their understanding of this process of valuing Transferred Risk.

Step 2 (Identify optimal risk allocation) is dealt with in Section 7 (Identifying desired risk allocation) and Step 3 (Calculate Transferred Risk) in Section 7.2.

7.2 Calculate Transferred Risk

Once all the Transferred Risks have been identified, the size and timing of the expected cash flows associated with each risk needs to be aggregated to determine the NPC of the Transferred Risk component of the PSC. Each of the risks should be included as a separate

cash flow item and then added to form the Transferred Risk component to allow for a detailed analysis of the key risks and their sensitivity to the overall PSC.

Risk Allocation and Standard Commercial Principles provides further detail on the risk allocation framework.

Example 2 Valuing Transferred Risk

Consider a project for the provision of a new educational facility and related ancillary services. The material and quantifiable risks associated with the project, which have been summarised and simplified in this example, are then allocated as shown in Table 7-1.

Table 7-1 Simplified risk allocation

Risk	Transferred Risk	Retained Risk
Design and construction risk	x	
Change in law risk		x
Operating risk	x	
Demand risk • base level demand • additional usage*	 x	 x
Maintenance risk	x	
Security risk (e.g. vandalism) • during school hours • after school hours	 x	 x
Technology risk (e.g. computers)	x	

* Includes any potential third-party revenue risk.

The costs and revenues associated with each of the Transferred Risks are then specified in the PSC model as a periodic cash flow based on the expected timing of their financial impact through the process outlined in Example 2. Table 7-2 is an example of the Transferred Risk section of the PSC model for the first five years of a project.

Table 7-2 Transferred Risk cash flow valuation — real flows

Cost	Year 0 ($m)	Year 1 ($m)	Year 2 ($m)	Year 3 ($m)	Year 4 ($m)	Year 5 ($m)
Design and construction risk	10.0	20.0	2.5			
Operating risk		5.0	5.0	5.0	5.0	5.0
Demand risk additional usage		0.5	0.5	0.5	0.5	0.5
Maintenance risk		2.0	2.0	2.0	2.0	2.0
Security risk (e.g. vandalism) after school hours			1.0	1.0	1.0	1.0
Technology risk (e.g. computers)		1.0	2.0	3.5	4.5	2.0

Example 2 Continued

Note that there is a small design and construction risk cost remaining in Year 2, due to the low probability of a delay greater than one year. Technology risk is assumed to increase prior to replacement, due to the increased risk of technological obsolescence over time.

The effects of expected inflation (or appropriate cost index) are now included to give the appropriate periodic cash flows, and are then discounted to give the present value of Retained Risk for the project. In this example, all costs are assumed to increase by inflation at 2.5 per cent per year.

Table 7-3 Transferred Risk cash flow valuation — nominal flows

Cost	Year 0 ($m)	Year 1 ($m)	Year 2 ($m)	Year 3 ($m)	Year 4 ($m)	Year 5 ($m)
Design and construction risk	10.0	20.5	2.6			
Operating risk		5.1	5.3	5.4	5.5	5.7
Demand risk						
• additional usage		0.5	0.5	0.5	0.6	0.6
Maintenance risk		2.1	2.1	2.2	2.2	2.3
Security risk (e.g. vandalism)						
• after school hours			1.1	1.1	1.1	1.1
Technology risk (e.g. computers)		1.0	2.1	3.8	5.0	2.3
Total Transferred Risk	10.0	29.2	13.7	12.9	14.3	11.9
Discount factor (assume discount rate @ 8.65% p.a.)	1.00	1.09	1.18	1.28	1.39	1.51
Discounted cash flows	10.0	26.9	11.6	10.1	10.3	7.8
Present value	**76.7**					

In this hypothetical example, the present value of Transferred Risk for the project is $76.7 million. This demonstrates the importance of accurately assessing the expected timing as well as the size of the costs of risk.

7.3 Relevance of insurance

If a Transferred Risk is commercially insurable, the value of that risk can be approximated by the periodic cost of the applicable commercial insurance premium. Commercial insurance is available to cover a number of risks including construction and contractor insurance, equipment failure and technology risk. However, where government reasonably expects to be able to manage a risk at a lower cost, or the risk is to be transferred under a public procurement, insurance would not be taken out and should not be used as the proxy value in a PSC.

This can be contrasted with Retained Risks, where commercial insurance premiums would instead be included as a cost in the Raw PSC where commercial insurance would be taken out. Treatment of insurable Retained Risks is discussed in Section 8.3.

8 Calculating Retained Risk

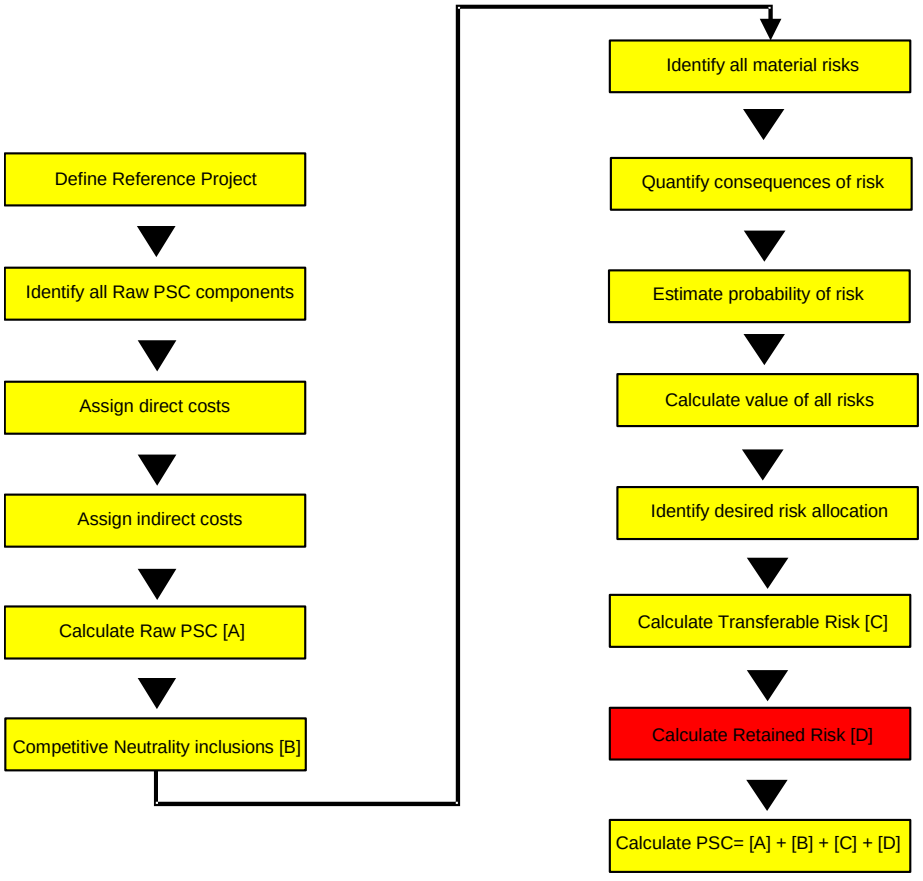
8.1 Defining Retained Risk

Retained Risks are those risks or parts of a risk that government proposes to bear itself under a PPP arrangement. Governments retain any risks that are not transferred to the private sector. The cost of Retained Risk provides a comprehensive measure of the full cost to government. In evaluating private sector bids, Retained Risk may be added, or omitted from the PSC, providing private sector bids are treated consistently.

The scope of Retained Risk reflects the nature of the project and the output specification. Where government retains responsibility for the provision of certain services, these should not be considered in the intended risk allocation, as they out of scope to the Reference Project. For example, in a project for the provision of educational facilities, government retains any risk associated with changing the functional requirements or services to be provided a part of the project. This risk is considered as part of the project's Retained Risk.

Figure 8-1 illustrates the role of Retained Risk in the construction of a PSC.

Figure 8-1 The PSC process — Retained Risk



Although both Transferred and Retained Risks are calculated from the same standpoint in a PSC (as the cost to government of holding the risk), they are treated as separate components for the following reasons:

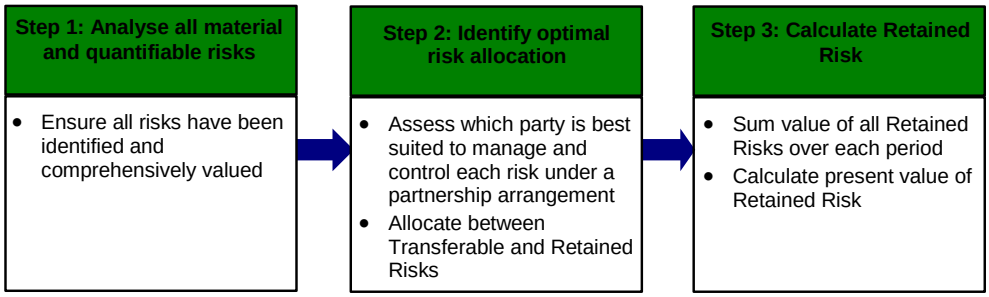
- The NPC of retained Risk may be added to the NPC of private bids to determine the true cost to government under a proposed partnership model; and

- maintaining a clear distinction between Transferred and Retained Risks focuses attention on the factors influencing risk transfer and the proposed level of that transfer.

8.2 Valuing Retained Risk

Valuing Retained Risk represents the final stage in the construction of a PSC. This process can be summarised in the following steps:

Figure 8-2 Steps in valuing Retained Risk



Step 1 (analyse all material and quantifiable risks) builds on the general risk valuation methodology provided in Section 6.2. Again it should be emphasised that all material risks need to be identified and valued before considering allocation issues. Practitioners are encouraged to revisit Section 8.2 as required to supplement their understanding of this process of valuing Retained Risk.

Step 2 (identify optimal risk allocation) is addressed in Section 7 as part of determining the optimal risk allocation for the purposes of valuing Transferred Risk and Step 3 (calculate Retained Risk) is dealt with in this Section 8.

Although the types of risk that should be borne by government need to be assessed individually for each project, Retained Risk may typically include:

- state change in law risk;
- the portion of commissioning or defect risks that may be caused by flaws in the output specification; and
- the portion of demand risk which government may assume, for example if the output specification contains a base level of demand.

Government may generally be suited to managing parts of state change in law risk due to its unique understanding and role in the regulatory process. Valuing change in law risk first requires an assessment of the impact of the key regulations/legislation influencing a project, and the likely impact of changes to the current regulatory framework. In the short term, for example, government may be better able to manage changes to the regulatory environment over which it has jurisdiction (i.e. Australian State laws and regulations). Change in law risk is discussed further in *Risk Allocation and Standard Commercial Principles*.

There may also be additional risks that government agrees to take for policy or other reasons. This recognises the particular responsibilities and accountabilities of government with respect to the delivery of services to the community.

Once all the Retained Risks have been identified, the size and timing of the expected cash flows associated with each of these risks needs to be aggregated to determine the NPC of the Retained Risk component of the PSC. Each of the risks should be included as a separate cash flow item and then added to form the Retained Risk component to allow for a detailed analysis of the key risks and their sensitivity to the overall PSC.

Example 3 Valuing Retained Risk

Consider the project for the provision of a new educational facility and related ancillary services discussed in Example 2 (Section 7.2). Again, the project risks have been allocated as shown in Table 8-1.

Table 8-1 Simplified risk allocation

Risk	Transferred Risk	Retained Risk
Design and construction risk	x	
Change in law risk		x
Operating risk	x	
Demand risk • base level demand • additional usage*	 x	x
Maintenance risk	x	
Security risk (e.g. vandalism) • during school hours • after school hours	 x	x
Technology risk (e.g. computers)	x	

*Includes any potential third-party revenue risk

Example 3 (cont.)

For the first five years of the project, the real periodic cash flows for the Retained Risk component of the PSC may look something like Table 8-2.

Table 8-2 Retained Risk cash flow valuation — real flows

Cost	Year 0 ($m)	Year 1 ($m)	Year 2 ($m)	Year 3 ($m)	Year 4 ($m)	Year 5 ($m)
Change in law risk		0.5	1.0	2.0	3.0	3.0
Demand risk						
• base level demand		0.5	0.5	0.5	0.5	0.5
Security risk (e.g. vandalism)						
• during school hours		1.0	1.0	1.0	1.0	1.0

Note that the financial impact of change in law risk increases over time, due to increasing uncertainty in the future (e.g. changes to wheelchair or other access requirements, or an increase in safety obligations that may require alterations to the facilities).

The effects of expected inflation (or appropriate cost index) are added to give the appropriate periodic cash flows and are then discounted to give the present value of Retained Risk for the project. In Table 8-3, all costs are inflated at 2.5 per cent per year.

Table 8-3 Retained Risk cash flow valuation — nominal flows

Cost	Year 0 ($m)	Year 1 ($m)	Year 2 ($m)	Year 3 ($m)	Year 4 ($m)	Year 5 ($m)
Change in law risk		0.5	1.1	2.2	3.3	3.4
Demand risk						
• base level demand		0.5	0.5	0.5	0.6	0.6
Security risk (e.g. vandalism)						
• during school hours		1.1	1.1	1.1	1.1	1.1
Total Retained Risk	*0.0*	*2.1*	*2.7*	*3.8*	*5.0*	*5.1*
Discount factor @ 8.65% p.a. (assumed)	1.00	1.09	1.18	1.28	1.39	1.51
Discounted cash flows	*0.0*	*2.0*	*2.3*	*3.0*	*3.6*	*3.4*
Present value	**14.3**					

In the above example, the value of Retained Risk is $14.3 million. The total value of risk in the PSC is therefore $91.0 million (including $76.7 million for Transferred Risk).

8.3 Risk mitigation — relevance of insurance

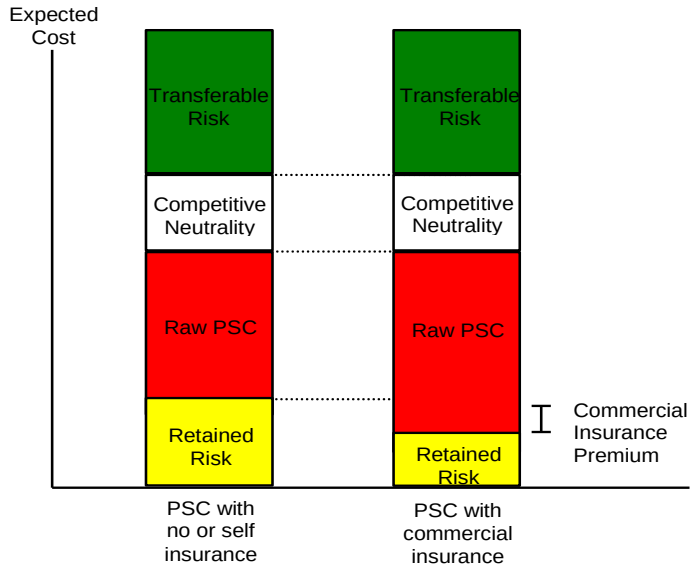
When evaluating Retained Risk (for the purpose of constructing the PSC), specific consideration should be given to the ability of government to mitigate risks in practice. Risk mitigation is all about minimising and controlling either or both the consequences and the probability of a risk eventuating. Factors that may help mitigate Retained Risks include:

- ability to influence directly the probability of a risk eventuating;
- utilising proven technology and reputable contractors;
- developing effective monitoring and risk management practices; and
- maintaining appropriate insurance coverage.

Third-party insurance should be considered for economically insurable Retained Risks. Insurance coverage for commercial risks retained by Australian government agencies should be discussed with the relevant government insurer. Alternatively, government could self-insure. Self-insurance, which has been traditionally used by government, is the preferred approach where the cost of it is less than commercial insurance. Ideally, self-insurance should involve setting aside the premiums in a fund or dedicated reserve.

Where government uses commercial insurance (e.g. construction or contractor insurance), the cost of the insured risk to government is no longer included as a Retained Risk, since it has been passed at a cost to a third party. Instead, the cost of premiums should be included in the Raw PSC. Figure 8-3 illustrates the relevance of insurance in the valuation of Retained Risk.

Figure 8-3 Treatment of commercial insurance



The diagram also illustrates that not all Retained Risks are likely to be commercially insurable (e.g. change in law risk) — if they were, there would be no Retained Risk section in the second column in the diagram.

Alternatively, where no third-party insurance, or self-insurance is used, the cost should remain a Retained Risk, as the risk remains with government as a whole. However, the value of the Retained Risk may be estimated by calculating a notional insurance premium based on past losses or the applicable commercial premium for a similar insurable item.

8.4 The materiality of Retained Risk in the PSC

All material Retained Risks should be included and valued to provide a comprehensive measure of the full cost to government under a PSC. Where a material risk is difficult to quantify objectively, a reasonable subjective assessment may need to be made. Again, valuing the PSC needs to be flexible and appropriate for each project.

If Retained Risks are not expected to be significant and the level of risk transfer is expected to be the same between the bidders and the PSC, a specific valuation of Retained Risk may not be necessary.

8.5 Relevance of Retained Risk in bid evaluation

For projects where Retained Risk is included in the PSC, it should also be added to each of the private bids to allow a meaningful comparison with the PSC. However, the level of Retained Risk may need to be adjusted between bids to reflect the same level of risk transfer proposed by government. Inclusion of Retained Risk in private bids is illustrated in Section 8.2 (particularly in Example 3).

9 Evaluation - value for money

This section sets out the role the PSC plays in evaluating bids.

As noted in Section 3 the PSC is used as a quantitative benchmark against which to assess the bids. However, this quantitative assessment is only one component of the evaluation process.

9.1 Quantitative issues

9.1.1 PSC vs. bid – net present cost comparison

Every evaluation will consider a range of quantitative and qualitative factors. Usually the quantitative factor which receives the most attention is benchmarking the cost of the PSC against the costs in the bids received. To do this, the payment cash flows proposed by bidders are discounted to produce the net present cost (NPC) to government of each bid. This is compared to the NPC of the PSC, calculated by discounting the net cash flows in the PSC.

Note that care needs to be taken to ensure any departures from the RFP in bids are taken into account to ensure a like with like comparison with the PSC.

The cash difference between the NPC of a bid and the PSC is a powerful number. But despite all the care which has gone into the production of the PSC cash flow forecasts, the evaluating agency needs to look through the apparent certainty of any single figure, and recall that it is still an uncertain estimate, and that it only captures some of the important elements in choosing how to deliver a project. For some projects, a sophisticated risk valuation process is warranted.

9.1.2 Impact on services

The second quantitative element which should be assessed is any differential impact on the cost of delivery of government services. If the private sector bid incorporates additional innovations which will make it cheaper (or more expensive) for government to deliver services, this needs to be taken into account. For example, a bid for a hospital facilities contract may incorporate a novel design which reduces the cost to government of delivering medical services in the facility. These savings, and their sustainability, should be estimated and taken into account in the evaluation. For social infrastructure projects, the estimation of the quantitative impact on core service delivery can be very important.

9.2 Adjustments to bids and the PSC

Sometimes, adjustments will need to be made to the PSC, or to bids, in the evaluation process. This section sets out some cases requiring adjustments and how they should be handled.

9.2.1 Adjusting bids

Bidders are generally asked to submit bids which comply with certain service criteria and financial specifications. However, in reality, bids may include some departures from the RFP. For example, they may:

- propose a different risk profile;
- fail to offer some aspect of the proposed service; and/or
- fail to meet some financial requirements, such as providing lower performance guarantee amounts.

Evaluation of such bids needs to take these deviations into account. Where possible, this should be done through 'clarification questions' to the bidder, with the bidder providing the cost impact of remedying the departure. Where this is not possible, or practicable, this may be done by estimating the additional cost to the bidder of complying with the requirements, and adding it to the bid cost. Care needs to be taken that evaluation of the PSC against the bids takes into account any departures from the output specification service requirements and risk profile to ensure a like for like comparison.

Bids may also use different assumptions about variables such as future interest and inflation rates. To the extent that changes in variables outside the bidders' control will affect the cost to government, the bids should be normalised so that they all use the same assumptions.

9.2.2 Adjusting the PSC

The PSC should only be changed after bids are received if it becomes apparent a significant component has been mispriced or omitted. For example, the bids could indicate the existence of risks which the team preparing the PSC failed to fully appreciate. It would be better to include the risks explicitly in the PSC than to omit them and understate the full cost of the PSC. Another example is if any assumptions change materially from when the PSC is finalised (before release of the RFP) and receipt of bids. This may be particularly relevant during elongated tender processes and/or if a marked change in market conditions has occurred since the PSC was prepared. Construction and insurance costs, for example, can be volatile and move materially between completion of the PSC and receipt of bids.

The bids may also show that some assumptions in the PSC are inaccurate. For example, if the project includes supply of commercial services, both the PSC and the bids will include estimates of demand. If the bids have relatively consistent demand forecasts at a particular level, while the PSC forecast is an outlier, it may indicate the PSC forecast is mistaken.

On the other hand, if the PSC contains numbers in which the agency is confident, it should not adjust the PSC just because the numbers in the bids are different. For example, if the agency has good estimates of construction costs, it should not reduce these just because the construction costs shown in the bids are lower.

Adjusting the PSC should be approached with caution and good judgment. In general, an adjustment will be justified if significant new information indicating that the PSC is incomplete or not credible becomes available. Making such changes should be a decision of the project manager (and steering committee where necessary), in consultation with the probity adviser. The PSC **should not be altered** to reflect alternate or more efficient service delivery methods by a bidder or bidders.

9.3 Quantitative assessment

The PSC is the key management tool in the quantitative assessment of value for money during the procurement process and the evaluation and comparison of bids. Bidders will be required to bid on an individual RFP that includes an output specification and a contract, setting out the risks expected to be allocated to the bidders. The bids should firstly be assessed against the RFP to determine whether they are conforming bids, and secondly against the PSC.

Bids should be evaluated to assess whether each Proposal is based on the same level of risk transfer as set out in the RFP. For instance, a bid may also accept additional risks that were not required to be accepted, but which may provide some additional value to government. As considered in the *Risk Allocation and Standard Commercial Principles* guide, all risks not explicitly taken by government will be borne by the bidder. The financial impact of the risks taken by government (i.e. Retained Risk) should be added to each bid to show the total project delivery cost.

Table 9-1 sets out an example of three conforming and three non-conforming bids for a hospital project. Conforming bids are those that have adhered to the requirements of the RFP, including complying with the risk allocation proposed by government and the output specification

Table 9-1 Bid evaluation process — conforming and non-conforming bids

	Conforming bids				Non-conforming bids		
Bids	**PSC**	**A**	**B**	**C**	**D**	**E**	**F**
Raw costs (NPC – $m)							
• service charge to government	80						
Competitive Neutrality							
• state taxes	7						
Risks valued by government							
Transferred Risks							
• design and construction	25				Transfer	Transfer	Transfer
• operations	10				Transfer	Transfer	Transfer
• maintenance	5				Retained	Transfer	Transfer
NPC-Subtotal	127	100	120	110	98	117	111
Retained Risks							
• maintenance					5		
• environmental	10	10	10	10	10	10	Transfer
• technology	15	15	15	15	15	Transfer	15
Total NPC of services	152	125	145	135	128	127	126

Prior to evaluation, bids may need to be standardised to be comparable between each other and the PSC.

In the example in Table 9-1, all of the conforming bids have accepted the level of risk transfer outlined in the contract released with the RFP. In choosing from the complying bids, Bid A would be the most likely option, as it has the same risk transfer structure as the other

conforming bids, but has the lowest NPC cost of services to government. In addition, Bid A's NPC total cost of services is lower than the PSC's total cost of services. It should be noted that a complete value for money assessment also requires consideration of qualitative factors along with the quantitative assessment in order to identify the best outcome. This is further explained in Section 9.4 below.

Bidder A has submitted a bid with an NPC of $100 million which includes Transferred Risk valued in the PSC at $40 million. The bid, however, excludes the Retained Risks valued at $25 million in the PSC. The total bid cost to government is the NPC of the bidder's service charges of $100 million and the costs of the Retained Risks, giving a total cost of $125 million.

The risk-adjusted Bid A of $125 million compares favourably against the PSC cost of $152 million. Setting aside qualitative considerations in order to illustrate how bids are compared initially based on NPC, value for money is achieved where the NPC of service charge for a bidder is lower than the NPC of the expected cost to government under the PSC**.** However, although Bid A provides the lowest NPC, VFM is also determined by taking into account qualitative factors.

The non-conforming bids should be considered also as the conforming bids may not necessarily present the best outcome for government. Prior to considering the non-conforming bids, the procurement team needs to consider whether accepting an alternate bid is within the bidding terms and must ensure that all bidders were provided with the opportunity to bid on an alternative basis. As advised in the *Practitioners' Guide*, bidders who provide a non-conforming bid should also submit a conforming bid, as government may not always consider non-conforming bids.

A review of the three non-conforming bids D, E and F shows that they have accepted different combinations of risk transfer.

- Bid D: $98 million, includes transfer of design and construction risk and operational risk, but excludes maintenance risk (to be borne by government) valued at $5 million in the PSC.

- Bid E: $117 million, includes the transfer of design and construction, operational and maintenance risk and, in addition, accepts technology risk, valued at $15 million in the PSC.

- Bid F: $111 million, includes the transfer of design and construction, operational and maintenance risk and also accepts environmental risk, valued at $10 million in the PSC.

The example shows that all three non-conforming bids need to be standardised so that the bids can be compared. The bids are adjusted for the risks to be retained by government in order to calculate the revised cost of the services to government, and to compare the bids against the PSC.

In the case of Bid E, this requires the environmental risk cost of $10 million (included in the PSC) to be added to the cost of the services. On the other hand, Bid F requires the PSC's technology risk of $15 million to be added to the cost of the bid. The non-conforming bids D, E and F are $128 million, $127 million and $126 million respectively. Of the non-conforming bids, Bid F would appear to represent the least cost option to government. However, before completing the evaluation, government should again consider the benefits that each of the bids offers, as each bid has accepted different risks. For example, Bid D has not accepted maintenance risk, which was one of the risks required to be accepted as part of the conforming bid requirements. Alternatively, Bidder E has accepted technology risk valued by government at $15 million and Bidder F has accepted environmental risk (both not required as part of the original RFP, but which may nevertheless be attractive to government).

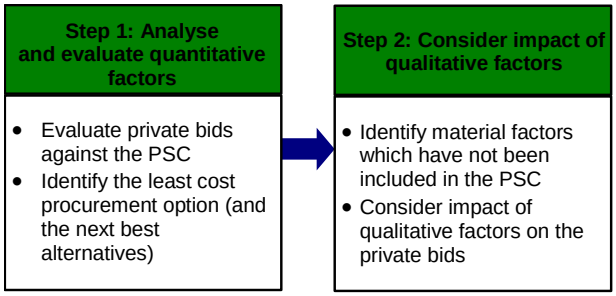
Conforming Bid A still offers the best value for money in the absence of qualitative considerations. However, non-conforming bids are worthy of considering if they transfer a high variance risk which government may see value in transferring. This is a major issue to

consider, particularly when comparing Bids E and F and the potential variability of technology risk compared to environmental risk.

9.4 Qualitative and broader value for money considerations

Assessing the private bids against the PSC provides a quantitative answer to the value for money question. However a complete value for money assessment requires consideration of qualitative factors along with the quantitative assessment. Therefore, identifying the best outcome requires a flexible valuation process and, therefore, the consideration of the qualitative factors associated with the bidders' Proposals that have not been explicitly valued. Figure 9-1 shows how this process should proceed.

Figure 9-1 Evaluating bids: a fully informed process



These two tests can be considered concurrently, although the initial quantitative assessment should generally be performed first. The complete evaluation process needs to be completed during the bidding process and project finalisation review stages outlined in Section 9.

Qualitative factors are particularly important where the lowest private bids are close to the PSC. However, this is usually resolved through a Best and Final Offer (BAFO) process.

Where value for money decisions reflect the consideration of qualitative factors, these must be fully documented to leave a verifiable decision trail which can be used by parties involved in the decision-making process. To this end, it is important that the procurement team constructs a list of all qualitative factors at an early stage. This may be developed in conjunction with the PSC, to identify costs that could not be meaningfully quantified in the PSC. (For further discussion on bid evaluation and the value for money assessment, see relevant chapters of the *Practitioners' Guide*.)

As discussed in the *Practitioners' Guide,* consideration of these factors should take account of whether the costs and risks apply only to the particular project or whether they should more appropriately be accounted for against projects generally.

Part Two: Public Sector Comparator Worked Example

Part Two of the *Public Sector Comparator Guidance* provides detailed guidance to government departments and agencies considering how to construct and document a PSC. This document gives step-by-step guidance on constructing all elements of the PSC and documenting the outputs.

The appendices provide the detail behind the numbers stated in this report.

Structure of the worked example

The PSC Worked Example has been constructed as a fully documented PSC report by the project team for a hypothetical hospital project. Interspersed within the worked example, but not part of it, are further explanations and guidance in the highlighted blue boxes.

Each PSC report should have an executive summary and the worked example begins with this section and then works through the remaining sections of the report.

The intention is for departments pursuing a PPP project to use this worked example as a basis and a guide, rather than a template for the construction of PSCs. No electronic spreadsheet templates have been provided. Care should be taken in constructing a PSC for a particular project to appropriately cater for the unique features of that project.

The PSC constructed is also a live document and should therefore be referred to and amended as appropriate throughout the procurement process. In particular, it should be used to manage risk.

Financial models

The financial models in the appendices to Part Two show the outcomes of simple risk evaluation (Appendix C) and advanced risk evaluation (Appendix D) for the hypothetical hospital project.

10 Structure of the PSC Worked Example

A PSC report has the following sections. The relevant section numbers in this worked example are listed in the right-hand column.

PSC report section	Worked example section
1 Executive summary, including: • key project details • risk-adjusted PSC (simple probability valuation technique) • risk-adjusted PSC (advanced probability valuation technique) • risk distribution curves	Section 10
2 Purpose of the PSC report, including: • background • terms of reference • structure of the report	Section 11
3 Description of the project, including: • objectives • service need • the reference project and commercial development	Section 12
4 Financial assumptions, including: • discount rate • inflation • goods and services tax	Section 13
5 The Raw PSC	Section 14
6 Competitive Neutrality	Section 15
7 Identifying, allocating and evaluating risk, including: • methodology • risk valuation • sensitivity analysis • reality check	Section 16
8 Managing risk	Section 17
9 Review	Section 18

10.1 Hospital project PSC – Executive summary

Guidance notes - Executive summary

The executive summary of the report on constructing the Public Sector Comparator should be drafted as a stand-alone document that can be appended to government submissions. At a minimum, the executive summary should document the following:

- purpose of the PSC
- sources of the cost information
- process for refining and finalising the PSC (as appropriate)
- key results from the PSC financial modelling undertaken.

(Note that guidance notes in each section of this example executive summary are also provided in the relevant in Part Two.) Please also note that the figures, for example the percentage of risk transferred etc., are for illustrative purposes only. In practice, these percentages differ from project to project.

When to use the simple technique, or the advanced technique for evaluating project risks is discussed in detail in Chapter 16. In the worked example executive summary both methods are given, although in practice one or the other method will be used.

Executive summary (worked example)

This report presents the compilation and calculation of the Public Sector Comparator for a hospital project (the project). It documents, in particular:

- the compilation and calculation of the Raw PSC and the risk-adjusted PSC;
- the project's material risks, both quantifiable and unquantifiable;
- the methodology for the quantification of project risks; and
- the results of the financial analysis.

All of these factors have been prepared according to the *Public Sector Comparator Guidance*.

The purpose of the PSC is to:

1 provide a benchmark against which government can compare private sector bids; and

2 assist in determining whether government is receiving value for money from the delivery of the project by the private sector.

The PSC estimates the risk-adjusted cost if the project were to be financed, owned and implemented by government. The cost information for the PSC was prepared by [insert sources of information]. The costs reflect the reference project, the payment mechanism and risk allocation as outlined in the project agreement released with the RFP, and the most efficient, likely, achievable form and means of government delivery.

It should be noted that, under a PPP, the PSC can be refined and finalised during the procurement of the project up to receipt of the submissions in response to the RFP. In general, refinement during the evaluation of submissions should only occur if the scope of the project changes, or it becomes apparent that a significant component has been mispriced or omitted.

10.2 Key project details

Table 10-1 details the basic costs incurred in the project's delivery. All figures are expressed in net present cost (NPC) terms reflecting costs/revenues assumed over the project's 12-year term, assuming a nominal discount rate of 7.62 per cent, based on a real pre-tax rate of 5 per cent and an inflation assumption of 2.5 per cent.

Table 10-1 Basic costs of delivering the project

Category	Item	NPC $m
Direct capital costs	Design	0.5
	Land	5.0
	Design and construct contract price	139.6
	Consultants	1.0
	Plant and equipment	46.5
	Capital improvements	11.8
	Through life capex	27.3
Indirect capital costs	Construction overheads	2.9
Total		**234.6**
Operating and maintenance	Maintenance	30.0
	Direct operating costs	85.3
	Indirect operating costs	5.9
Total		**121.2**
Third-party revenue		(35.0)
Competitive Neutrality		15.0
Total non-risk-adjusted PSC		**335.8**

10.3 Risk-adjusted PSC (simple probability valuation technique)

Guidance notes – Risk-adjusted PSC (simple probability technique)

Please note that the percentage of risk as a proportion of the total PSC in the simple and advanced evaluation technique worked examples below are for **illustrative purposes only, and each PPP project will have different risk profiles.**

This section explains and provides examples of the use of both the simple and advanced probability valuation techniques. The technique adopted for a particular project,or a particular risk depends on the significance of the project and the complexity of the risks within it. For further guidance refer to Appendix C and Appendix D of Part Two.

Table 10-2 details the results of the simple probability analysis.

Table 10-2: Simple probability analysis

	NPC $m	% of risk-adjusted PSC
Total non-risk-adjusted project cost (incl. Competitive Neutrality but excl. GST)	335.8	72
Retained Risk	11.1	2
Transferred Risk	119.4	26
Total risk-adjusted project costs (excl. GST)	**466.3**	**100**

Table 10-2 shows that Retained Risk represents two per cent of the total risk-adjusted PSC, comprising regulatory risk and maintenance risk relating to patient areas. Chapter 11 outlines the detail behind the numbers and the simple risk evaluation.

The majority of risk is transferred and represents 26 per cent of the risk-adjusted PSC with total project risk estimated to be 28 per cent of the total cost of the project. The total risk-adjusted PSC figure is $466.3 million. This is the best single-point PSC estimate.

Sensitivity analysis of the effect of movement of key cost components is summarised in Table 10-3. It indicates that the PSC estimate is particularly sensitive to movement in capital cost estimates.

Table 10-3: Sensitivity analysis of the effect of movement of cost components on project cost

	PSC NPC $m				
Movement in assumption	**Capital cost**	**Operating cost**	**Discount rate**	**Inflation rate**	**Maintenance and refurbishment**
-15%	418.1	448.6	479.9	466.1	455.2
-10%	434.1	454.4	475.2	466.1	458.8
-5%	450.1	460.2	470.6	466.1	462.5
Base case	**466.3**	**466.3**	**466.3**	**466.3**	**466.3**
5%	482.1	471.9	461.6	466.0	469.7
10%	498.0	477.7	457.2	466.0	473.3
15%	514.0	483.5	453.0	466.0	477.0

10.4 Risk-adjusted PSC (advanced probability valuation technique)

Guidance notes – Risk-adjusted PSC (advanced probability technique)

Detailed analysis and comparison of the PSC probability distribution of bids received as part of the procurement process should be carried out as part of bid evaluation. The shape of the distribution shows the nature of the risk profile faced by government and should be considered together with the mean PSC estimate. For instance, if the PSC probability distribution is positively skewed (i.e. skewed with a long tail to the right), a bid that lies above the PSC mean case could still be attractive to government as it may provide greater cost certainty and reduce the government's overall exposure to cost volatility.

The 5th and 95th percentiles can be included in the analysis simply to illustrate the P90 range or 90 per cent confidence limit within which the cost of risk is likely to fall. However, no greater weight should be given to these results than any other percentile result in the distribution.

Table 10-4 details the results of the advanced probability analysis expressed as the mean outcome from the risk simulation.

Table 10-4: Advanced probability analysis

	Mean	% of risk-adjusted PSC
Total non-risk-adjusted project cost (incl. Competitive Neutrality but excl. GST)	335.8	72
Retained Risk	12.8	3
Transferred Risk	116.0	25
Total risk-adjusted project costs (excl. GST)	**464.6**	**100**

The costs of risks contained in Table 10-4 above are mean estimates (i.e. weighted average) among a range of possible outcomes. It is, therefore, important to focus on the probability distributions generated by the advanced probability valuation technique rather than simply looking at the mean result in isolation. The best way to analyse these results is by looking at the shapes of the distribution curves for retained and Transferred Risk and for the Total PSC minus Retained Risk.

Guidance notes - Risk distribution curves

A knowledge of the Retained Risk probability distribution is important to assist government in providing for, and managing, such risks. However, given that Retained Risk, by definition, is always held by government, it is not a consideration in assessing whether bids offer value for money in comparison with the PSC (assuming that bids are not based on a different scope of Retained Risk – see Section 8.1).

Accordingly, the focus for bid evaluation purposes is the probability distribution for Transferred Risk transposed onto the Raw PSC and Competitive Neutrality adjustment, i.e. the Total PSC minus Retained Risk.

Figure 10-1 illustrates the frequency distribution for Transferred Risk detailing the mean and, for illustrative purposes, the 5th and 95th percentiles.

Figure 10-1: Transferred Risk frequency distribution and mean

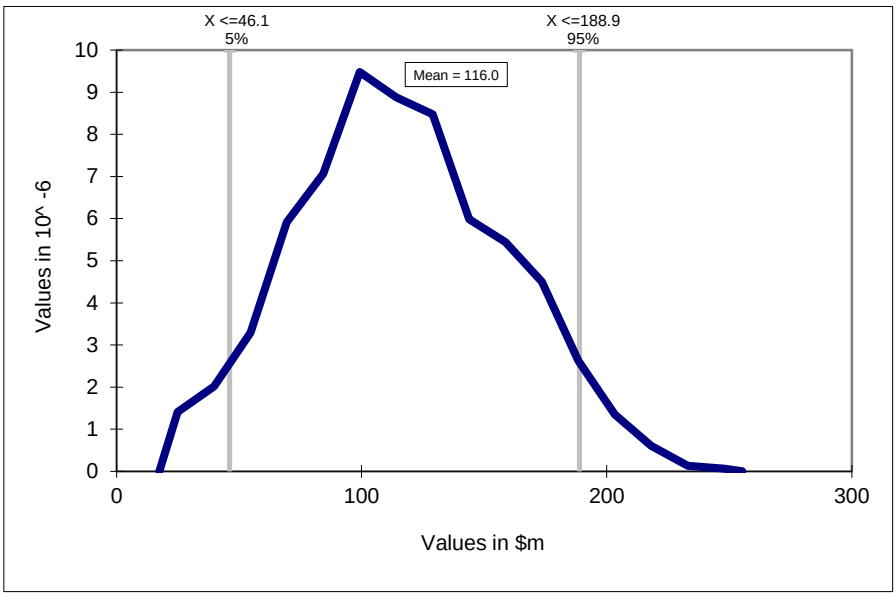


Figure 10-1 shows that the most frequently occurring value during the simulation is around $100 million and the mean estimate is $116 million. However, the distribution shows that Transferred Risk could have a cost impact of around $190 million at the 95th percentile (although the probability of this occurring is relatively low).

Figure 10-2 illustrates the frequency distribution for the Total PSC minus Retained Risk, detailing the mean, and for illustrative purposes the 5th and 95th percentiles. Of the frequency distributions produced, this is the most useful and will be the key benchmark against which PPP bids are evaluated.

Figure 10-2: Frequency distribution – Total PSC risk distribution less Retained Risk

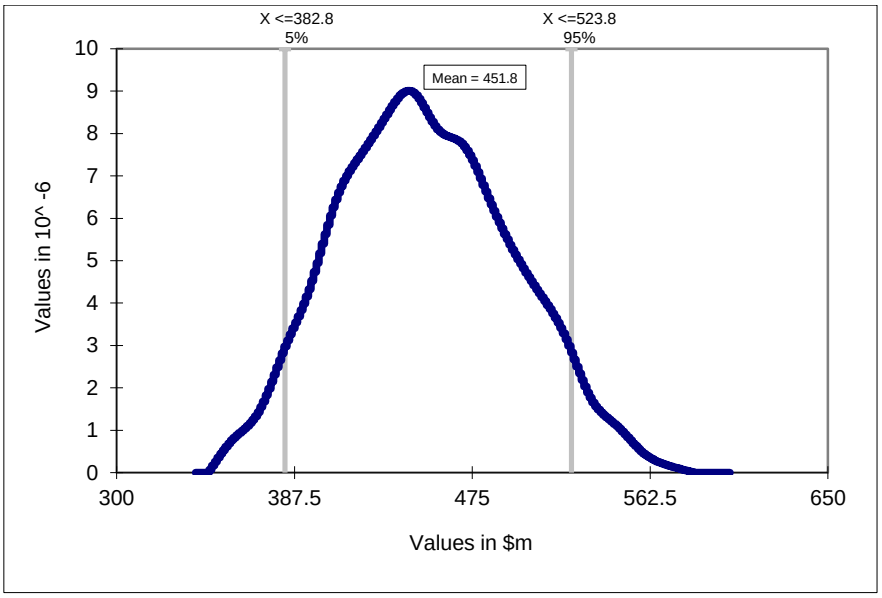


Figure 10-2 shows a slightly skewed distribution for this particular project.

The most frequently occurring value during the simulation is at around $445 million, which is slightly less than the mean of $451.8 million. However, the positively skewed distribution shows that the PSC (minus Retained Risk) could have a cost impact of over $520 million at the 95th percentile (although the probability of this occurring is relatively low).

Guidance notes – Risk distribution curves – advanced or simple evaluation technique

The lower risk-adjusted PSC under the advanced evaluation technique at the mean case ($464.6 million) was purposely derived to be lower than the risk-adjusted PSC under the simple evaluation technique ($466.3 million) in order to illustrate this worked example. Depending on the risk estimates provided by risk experts, it is also possible for the risk-adjusted PSC using the advanced technique to be higher than the risk-adjusted PSC under the simple technique.

The sensitivity of the effect of the movement of some key risk components is summarised in Table 10-5.

Table 10-5: Sensitivity analysis of the effect of movement of cost components on project cost-mean case basis

	PSC NPC $m				
Movement in assumption	**Capital cost**	**Operating cost**	**Discount rate**	**Inflation rate**	**Maintenance and refurbishment**
-15%	427.4	451.1	478.6	466.5	455.8
-10%	439.7	455.5	474.4	465.1	458.7
-5%	452.1	460.0	467.5	464.6	461.5
Base case	**464.6**	**464.6**	**464.6**	**464.6**	**464.6**
5%	476.7	468.8	458.7	463.7	467.3
10%	489.1	473.3	455.2	462.5	470.1
15%	501.4	477.7	449.2	461.9	473.0

Note that Table 10-5 relates to the total PSC mean estimate (including Retained Risk) and indicates that the PSC estimate is particularly sensitive to movements in capital cost estimates.

11 Purpose of this PSC report

The purpose of this (example) report is to detail the compilation and calculation of the Raw Public Sector Comparator (Raw PSC), the calculation of the Competitive Neutrality adjustment and the risk-adjusted PSC, including a discussion of the project's material risks and the risk quantification process, according to the principles of the National PPP Guidelines.

The primary purpose of the PSC is to provide a benchmark against which government can compare private sector bids. It assists the government in determining whether it is receiving value for money (VFM) from the delivery of the project by the private sector.

11.1 Background

11.1.1 PPP project objectives

PPP projects aim to improve the delivery of infrastructure services to the community in a way which provides VFM and protects the public interest.

Value for money is maximised by allocating risk optimally. In general terms, this means allocating each risk to the party best able to manage that risk. In theory, this reduces individual risk premiums and the overall cost of the project because the party in the best position to manage a particular risk should be able to do so at the lowest price.

The main drivers behind potential VFM are:

(i) **risk allocation.** Pricing risk with the party who is better able to manage it at least cost;

(ii) **whole-of-life costing.** Full integration of up-front design and construction costs with ongoing service delivery, operational, maintenance and refurbishment costs;

(iii) **innovation.** Focuses on output specifications, providing wider opportunity and using competition as an incentive for bidders to develop innovative solutions in meeting these specifications; and

(iv) **asset utilisation.** In some instances, private sector providers are motivated to develop opportunities for revenue generation beyond the government payment stream and this may be used in part to reduce the cost of services to government.

PPP projects also deliver the following results on a regular basis:

(i) **focus on service delivery.** Allows a sponsoring department, or agency to enter into a long-term contract for services to be delivered when and as required; and

(ii) **predictability of costs and funding.** Ensures that whole-of-life costing and budgeting are considered, providing infrastructure and related ancillary services to specification for a significant period, including any growth or upgrade requirements.

11.1.2 Explaining the PSC

The PSC represents the estimated total cost to the government of meeting the output specifications under a public procurement delivery method. Therefore, the PSC:

- includes a full estimated cost analysis of the project at an early stage;
- is a key management tool during the procurement process because it focuses attention on the output specification, risk allocation and development of a comprehensive estimate for the project;
- provides a means of demonstrating likely VFM;
- provides a consistent benchmark and bid evaluation tool; and
- encourages the private sector to put forward its most efficient bids.

The key attributes of the PSC are:

(i) it is stated in net present cost (NPC) terms by discounting projected cash flows using the discount rate;

(ii) it is costed over the life of the project; and

(iii) it takes account of the risks identified in the forecast cash flows.

The PSC is comprised of four segments:

(i) Raw PSC;

(ii) Competitive Neutrality;

(iii) Transferred Risk; and

(iv) Retained Risk.

11.1.3 The importance of valuing risk

Risk and uncertainty are inherent in all projects no matter what the size of the project. Serious consequences of risk for projects can be broadly summarised as:

- failure to keep within the cost estimate;
- failure to achieve completion date; and
- failure to achieve the required quality and operational requirements.

All too often risk is either ignored, or dealt with in an arbitrary way. For example, simply adding 10 per cent contingency onto the estimated cost of a project is typical. As this approach makes little attempt to identify and assess the risks in a project, this contingency may be inadequate and there may be a resultant cost blow-out and delay. It is, therefore, essential that risks are identified and valued where possible in order to gain a full appreciation of the likely outturn cost to government of pursuing this project.

The identification and costing of risks is particularly important in PPP projects, as risk allocation and its financial consequences play a key role in assessing value for money and in contract negotiation.

11.1.4 Value for money

One of the key objectives of PPP project is to ensure that government gets value for money. This requires:

- a competitive environment for PPP projects;
- application of rigorous financial appraisal techniques including a proper appreciation of the consequences of risk;
- optimal allocation of risk between the parties;
- fair, realistic and comprehensive comparisons between publicly and privately financed options; and
- consideration of qualitative factors which cannot be explicitly valued, but which may impact on government's cost of delivery of core services, for example:
  - the identity, credit standing and proven reputation of the bidder;
  - any differences in service delivery which cannot be quantified and adjusted for;
  - the likely sustainability of service delivery; and
  - design amenity, particularly for important major public buildings (e.g. Spencer Street Station).

There may be additional benefits in selecting a PPP delivery option relating to the cost to government of delivering the project's core services.

11.2 Terms of reference

Guidance notes - Terms of reference

This section outlines, in general, the scope of work required to compile the reference project, the raw cost estimates, competitive neutrality and risk evaluation for the PSC. It details the most appropriate people to undertake the estimate for each item and the recommended level of detail that should be provided to model the PSC.

The raw cost estimates are derived from the assumptions used for the reference project. The raw cost estimates should reflect the assumptions used for the reference project and any changes to the reference project should be reflected in changes to the cost estimates and to the associated risk estimates.

Part One of the *Public Sector Comparator Guidance* provides detailed guidance on determining the most appropriate risk valuation technique (see section 6). It explains and provides examples of both the simple and the advanced valuation technique. It also states that the technique adopted for a particular project or a particular risk depends on the significance of the project and the complexity of the risks within it.

When selecting a risk valuation technique, factors to be considered include:

- the relative impact of the risk on the project;
- the size of the project; and
- the complexity of the project.

Guidance notes - Terms of reference

For example, a relatively simple project such as a hospital car park is unlikely to warrant sophisticated advanced probability valuation techniques, whereas a more complex project, such as a hospital, may warrant such analysis. This should be a considered process, however. Even a hospital car park project may be structured to transfer significant usage risk to the private sector. It may be advisable to carry out a probability analysis on the volume projections for this risk. Advice from technical and financial advisers should also be sought and options discussed and agreed with other key stakeholders which may include the Relevant PPP Authority as appropriate.

11.2.1 Financial adviser terms of reference (example)

The [insert name of financial adviser] constructed the PSC financial model under the following terms of reference. These were to:

- carry out discounted cash flow analysis of the raw costs, competitive neutrality adjustments and risks associated with the reference project and incorporate these into a financial model using the most recent software available;
- construct and refine the PSC financial model throughout the PPP procurement process;
- plan and coordinate the collection of all quantitative data necessary to undertake the analysis outlined above, including data inputs provided by, among others, the Procuring Agency, [insert name of technical adviser] and the [insert name of health provider];
- document all PSC input assumptions, including but not limited to raw costs, competitive neutrality adjustments, and risks in a databook containing (as a minimum) the following information:
  - (i) source of input assumption;
  - (ii) date on which input information was provided;
  - (iii) reference document;
  - (iv) sign-off classification;
  - (v) further actions necessary (if input assumption has not been signed off);
- produce PSC financial model outputs consistent with the information requirements of the PSC and, in particular, numerical and graphical reporting on the following outputs;
  - (i) a summary cash flow for each component of the PSC;
  - (ii) the NPC of each component of the PSC discounted according to government methodology for deriving discount rates under the PPP;
  - (iii) the results of the risk evaluation;
- plan and coordinate the collection of all information requirements to refine the components of the PSC, including discussions and structured workshops between the Procuring Agency, [insert name of health provider], advisers to the project team and all other the key stakeholders;
- verify and confirm key project stakeholders;

- carry out sensitivity analysis on key inputs to the PSC financial model, including the discount rate, inflation rate and major raw cost categories;

- carry out risk analysis on the PSC financial model using either the simple or the advanced valuation technique and the terms of reference for risk valuation. The technique chosen for a particular project should be discussed with key stakeholders and the financial adviser to determine the most appropriate method;

- use an advanced risk valuation software, for example @Risk, or an equivalent software package for the advanced risk valuation;

- document operating instructions for using the PSC financial model; and

- review all assumptions with the technical adviser and client regularly throughout the PSC development.

The terms of reference for developing individual elements of the PSC are set out in the following sections.

11.2.2 Reference project

Guidance notes - Reference project

A major element in refining the PSC is the clear and complete identification of the reference project. This is particularly important for correctly identifying material project risks and therefore risk valuation. The reference project is the most likely and efficient form of public sector service delivery that could be employed to satisfy all elements of the output specification, as outlined in the RFP, based on current best practice.

The level of detail of the reference project will differ depending on the value of the project. The time spent to build the reference project and estimate the raw costs for a large project (e.g. $300 million), should be greater than for a project worth $30 million, for example. It is recommended that a value management plan be put in place, where, at the end of the reference project estimation process, a workshop is conducted with the key stakeholders to ensure that the reference project assumptions, level of detail and price certainty attained is reasonable given the size of proposed project. Consideration should be given to whether the best technical option has been designed for the reference project and to achieve the required services, and whether this design has been costed for the Raw PSC estimates.

The process of defining the reference project should start after the project output specifications have been developed to an advanced stage. This not only ensures that the reference project encompasses all the requirements of the project, but also it may help to assess the validity of the output specifications. It is sometimes easier to define output specifications after identifying the required inputs for the requisite project services.

Note that compiling a reference project for a social infrastructure project (e.g. a prison or a hospital) may differ in focus from an economic infrastructure project (e.g. a water treatment plant, a road). Therefore, the terms of reference listed in this worked example may not apply to all projects – although the level of detail should be taken as a guide, whatever the sector. For example, the operational philosophy of the core service provider for a social infrastructure project may have a major impact on the way the key accommodation is configured. While this may not be an issue in defining the reference project for a water treatment plant, nevertheless it would still be necessary to construct a process diagram to show linkages between different treatment processes.

Guidance notes - Reference project

The type of project may also dictate the group of advisers most suitable to compile the reference project. For instance, architects may be the most appropriate advisers to lead a serviced accommodation type project, but for an economic infrastructure project, engineers may be better placed to lead the project.

Where possible a geotechnical survey of the preferred site (if applicable) is recommended for all projects. This helps to accurately estimate the costs involved in building on a particular site taking into account specific ground conditions. It also highlights whether the site has the appropriate access to services (i.e. electricity, gas, water etc.) which may impact on costs.

The reference project (example)

The reference project has been developed in consultation with the Procuring Agency. The terms of reference for the reference project are:

- compilation of the reference project concept drawings. This is based on the draft project output specifications and the operational philosophy and objectives of government. The concept drawing encompasses
  - details of the site and positioning of buildings;
  - details of services access, e.g. electricity, water, gas, travel plan arrangements, parking, demonstrating how the flow around the site will be maintained throughout development;
  - functional relationships;
  - scale 1:500 (key areas shown at 1:200);
  - drawings to show year by year development including enablers, demolitions etc. and, for complex interfaces, further detail;
- schematic drawings of the key relationships, with a macro showing key areas at a scale of 1:100;
- diagram of the functional relationships for the whole project;
- assumptions of ground and site conditions based on the site geotechnical survey;
- estimates of costs involved in providing utility and other necessary services to the site;
- room data sheets for all key service areas;
- a cost estimate of the net area calculated on the room data sheets, with an appropriate industry standard grossing factor applied. Note that the net area usually includes mechanical and electrical services, specialist equipment and IT costs;
- a list of the required furniture, fixtures and equipment (FF&E) for the project and an estimation of the costs of procurement and installation according to the output specifications;

- details on the method of construction, with a construction program, development control plan, summary of construction assumptions and areas requiring special attention, e.g. de-watering; and

- a 'value' management exercise to check the reasonableness of technical aspects/underlying assumptions. Initiation of a VFM study in decisions about materials, using appropriate advisers.

11.2.3 Raw cost estimates

The raw cost estimates for the PSC based on the reference project have been provided in consultation with the Procuring Agency. The terms of reference for this work were to:

- estimate each cost in accordance with the scope of the project detailing assumptions used for each cost category and the breakdown of the costs in each cost category. These raw costs are to **exclude** contingencies, any risk component and contractor rates of return;

- provide the cost estimates in Australian dollars as at an agreed date and in **real** dollars;

- provide details on inflation/indexation estimates of costs for each cost category over the project term;

- estimate the 'S' curve (i.e. the timing of construction costs over the construction period) for each cost category (monthly S curves during the construction period, and yearly for the operating period);

- detail the assumptions regarding the payment terms of the contractor (i.e. are there any holding costs included in the raw estimates?);

- detail foreign exchange assumptions;

- provide clear insurance assumptions, including defined scope of insurance (specialist advice may be required);

- estimate the replacement cost of capital items and when they occur over the project term;

- detail and separate out the costs relating to competitive neutrality; and

- ensure that the costs provided correlate with the scope of the reference project and that any changes to the reference project are reflected in amended cost estimates.

11.2.4 Competitive neutrality (example)

In consultation with the Procuring Agency, competitive neutrality has been valued for inclusion in the PSC. The terms of reference for this work are:

- identify the areas where financial advantages and disadvantages accrue to government which are not equally available to a bidder under PPP procurement. The *Public Sector Comparator Guidance* identifies four types of costs which may have an effect on competitive neutrality

  1. land tax;
  2. local government rates;
  3. stamp duty;
  4. payroll tax;

- estimate the value of removing any net competitive neutrality effect; and
- forecast all net competitive neutrality effects over the life of the reference project and include these in the PSC on a cash flow basis (not on an accruals basis).

11.2.5 Risk valuation (example)

In consultation with the Procuring Agency, risk has been valued for inclusion in the PSC. The terms of reference for this work are to:

- facilitate the identification and quantification of project risks in accordance with the *Public Sector Comparator Guidance*, including the coordination and facilitation of all risk workshops and/or structured risk interviews required;
- conduct either the advanced, or the simple valuation technique on the identified risks in accordance with the *Public Sector Comparator Guidance*, i.e. the choice of technique is to be determined in consultation with advisers, the Procuring Agency and government;
- carry out quantitative analysis of the risks using financial modelling techniques as appropriate and incorporate the results into the overall PSC financial model; and
- document the risk identification and quantification process in accordance with the *Public Sector Comparator Guidance*.

11.3 Structure of this (example) report

This report documents the PSC for the hospital project and is structured in accordance with the PSC Worked Example as follows:

- Chapter 12 describes the project by documenting the objectives, service need and the main features of the reference project.
- Chapter 13 sets out the financial assumptions used in the financial modelling of the PSC including discount rate, inflation, and goods and services tax.
- Chapter 14 documents the components of the Raw PSC.
- Chapter 15 documents the Competitive Neutrality adjustments to the PSC.
- Chapter 16 documents the risk valuation process and results.
- Chapter 17 provides a starting point for risk management planning.
- Chapter 18 provides an example disclaimer statement and review of the PSC report and information.
- Appended to the *Public Sector Comparator Guidance* are two versions of the PSC financial model – one simple (Appendix C) and one advanced (Appendix D) – including operating instructions, input databook, outputs, risk register and all working cash flows.

12 Description of the project

Guidance notes – Project description

This section should describe the project and its objectives in clear and concise terms. A description of the background to the project, an explanation of the service need and the output specifications forms the basis of the reference project and the PSC.

Note that in the worked example, government undertakes some commercial development in the form of a florist and the collection of car parking revenue, even though these operations may be contracted out. Under a public sector delivery method, this is not considered unusual as part of the operator's scope of business. However, the government would not envisage any further commercial development, such as a private hospital or medihotel, as part of a PSC.

In developing the reference project and its associated PSC, a department should limit the scope strictly to activities which fall within its normal scope of business activity. Speculative commercial developments are often risky ventures and should only be included in the PSC if the department has experience of such developments and a mandate from government to pursue such business activities. Where a bidder proposes commercial development (i.e. beyond the commercial activities included in the reference project) as part of its bid, then the value of any land owned by the government, or the department which is used for the commercial development needs to be included in the bidder's Proposal. Under such circumstances, departments should seek advice from the Relevant PPP Authority and possibly also the Valuer-General.

Description of the project (example)

The Minister for Health has announced that a new publicly operated hospital would be delivered in Australia under the *National PPP Guidelines*.

The government is seeking to appoint a private sector party to undertake the hospital project (the project), the elements of which are facility services, which comprise the provision of a hospital, car park and associated services over an operating phase of 10 years.

In addition, to increase the ability of the private sector to produce value for money to the government, the private sector party is offered the opportunity to undertake certain commercial development on segments of the site that are not required for the delivery of the facility services. The primary purpose of the project, however, as stated in the RFP, is to procure the facility services and, in doing so, maximise the value for money which can be achieved by government.

The jurisdiction will be responsible for the provision of all publicly funded health and other clinical and non-clinical ancillary services at the hospital facility, which will form part of an integrated health service.

12.1 Objectives

As outlined in the RFP, the objectives of the project are:

(i) **value for money:** to procure hospital infrastructure and associated services under the policy in a way which delivers value for money and satisfies the public interest criteria of government;

(ii) **service quality**

- to improve access to health care services across the catchment area and to increase the provision of health care and hospital services to the general public;
- to assist government in achieving best practice in effectiveness of care, ensuring better patient outcomes and enhanced efficiency, both in the use of facilities and equipment and in operating costs; and
- to provide infrastructure facilities and services that assist government to attract and retain quality staff at all levels;

(iii) **sufficient capacity:** to provide infrastructure facilities and services to facilitate the carrying out by government of clinical and non-clinical functions at the hospital as they may be varied over time to meet community health care needs;

(iv) **operational efficiency:** to provide an operationally efficient facility capable of meeting the services specifications and which assists government to operate within the budgets allocated to the Procuring Agency;

(v) **flexibility:** to provide flexible infrastructure capable of adapting to future infrastructure needs, new technologies and clinical practice changes; and

(vi) **timeliness:** to secure delivery of the project in a timely and safe fashion.

12.2 Service need

A government review of hospital services and capital needs across a municipal metropolitan hospital system identified the need for a hospital in the local council area of [ ].[1] This project is required in response to this identified increase in demand for health services in this local government area. A services planning model was prepared by [ ], and this model has been re-evaluated given current demographic data and population forecasts for the catchment area. The Procuring Agency advises that the recommended service plan, will meet the current and future needs of the region up to and including the year [xxxx].

[1] [ ] indicates that the specific information for the project should be inserted.

The hospital core catchment area is defined as the [ ] which are located in the [ ] of the Metropolitan area. All public health care services for this catchment will be developed as part of government's clinical program and strategic service plans. The hospital facility will form part of a network of services and will link specifically with:

- [insert other hospital names] for [ ] services
- [insert other hospital names or other health services] for [ ] services.

The catchment area covers [ ] square kilometres and includes primarily large residential centres. The [ ] is experiencing population growth, and is expected to grow from [ ] in [ ] to [ ] by [ ], an increase of [ ] per cent.

The jurisdiction will be responsible for the provision of all publicly funded health and support services at the hospital and it will form part of an integrated health service, which includes the [ ] Hospital and [ ] Medical Centre.

It is proposed that the project will be a tertiary referral hospital and it will offer:

- acute tertiary inpatient medical and surgical services
- emergency services
- ambulatory outpatient services.

Table 12-1 summarises the bed and other configuration provided by the Procuring Agency. These configurations have been accepted by the Procuring Agency for the project and are based on the hospital satisfying [ ] per cent of all health service demand from the hospital catchment area.

Table 12-1: Bed configuration and day places by department – hospital project

Hospital service summary – Inpatient services	Facility profile
Haematology/Endocrinology/Gastroenterology	31 beds
General medical surgical	28 beds
Cardiology/Cardiothoracic	52 beds
Intensive care unit (ICU)	10 beds
Isolation	2 beds
Coronary care unit (CCU)	4 beds
Interview rooms	3 beds
Second-stage recovery	6 trolleys
	8 chairs
Neurology/Neurosurgery	42 beds
Respiratory	32 beds
Renal dialysis	7 places
Oncology/radiotherapy	7 day places
TOTAL BEDS	**210**
Total day places	**28**

Other supporting infrastructure and services across inpatient and outpatient services includes:

- emergency department – 30 cubicles
- ambulatory care
  - 20 interview cubicles
  - waiting area for 50 people
  - reception
- pathology/mortuary
- 5 operating theatres
- 2 endoscopy suites
- education facilities
- medical imaging
- pharmacy
- medical records
- administration
- public amenities/entrance
- staff amenities
- food services
- cafeteria
- supply and domestic services
- sterile supply service

12.3 The reference project and commercial development

The reference project used to build up the elements of the PSC is that which is the most likely and efficient form of public sector delivery which satisfies all aspects of the output specification requirements and key performance indicators, as outlined in the RFP.

With regard to commercial development, the RFP invites responses from the private sector with the inclusion of either integrated or non-integrated commercial development on the site which reduces the cost of the project to government. The primary purpose of this project, however, is the provision of the facility services and additional equipment.[2] Should government undertake the project via the traditional procurement method, the Procuring Agency advised that it would consider some limited commercial operations (e.g. florist/gift shop) on the site. Accordingly, car parking and retail revenue obtained from limited commercial development is included in the PSC.

[2] RFP reference

The reference project is broadly as follows:

(i) government will design, construct, finance, operate, and maintain the hospital

(ii) government will provide the following services[3]

- clinical services
- non-clinical services, including
  - internal cleaning
  - portering
  - supply and domestic services
  - internal waste management and disposal
  - management and administration of the pharmacy and library at the facility
  - management of linen supplies and food services
  - patient television services

(iii) government will manage the florist/gift shop, cafeteria and provision of patient entertainment, principally the patient television service

(iv) The jurisdiction will provide the following services with regard to the provision of the use of the building to government. These are collectively referred to as Building Services in the RFP[4]

- accommodation services
- mechanical services
- utility and energy services
- medical gas services
- fire and emergency services
- communication infrastructure services
- facility and site information services

(v) The jurisdiction will also provide the following ancillary services, which are defined as Support Services in the RFP[5]

- security services
- car parking services
- pest control services
- external cleaning services
- ground maintenance services
- help desk services
- training services

[3] RFP reference
[4] RFP reference
[5] RFP reference

(vi) the reference project assumes that planning approvals will be achieved by [insert date] and a two year construction period, commencing [insert date], followed by a ten year operating period (standard construction techniques were assumed to achieve this timeframe)[6]

(vii) government will retain ownership of the facility; however, the raw costs are based on a design and construct arrangement for the design and construction of the facility, outsourcing arrangements for the maintenance of the facility, and provision of the support services[7]

(viii) the hospital will be primarily two levels, balancing operational and functional best practice and local topographical aspects, with some areas, such as those which house engineering fit-outs, being single storey[8]

(ix) the building envelope and infrastructure have allowed for expansion to the side of the building and upwards[9]

(x) a net hospital area of [ ]m^2 with a grossing factor of [ ] per cent applied to the minimum net areas provided in the RFP, and a further [ ] per cent applied to the whole of the gross functional areas as follows[10]

- [ ] per cent travel
- [ ] per cent engineering

(xi) the building fabric, plant and equipment, fixtures and fittings are to be of a standard similar to those at [ ] Hospital[11]

(xii) with regard to landscaping, the PSC has allowed the treatment of approximately [ ]m^2 with varying levels of landscaping, assumed to include grass, paving and garden beds with appropriate irrigation systems – all designed in such a way that the overall landscaping requires a low level of maintenance[12]

(xiii) an [ ]m^2 on-grade car park will service the hospital[13]

(xiv) refurbishment of existing infrastructure is planned to occur in Year 5, 8 and 11 based on a detailed works program and industry best practice.[14]

6 Advice from technical consultant
7 Reference advice received
8 Reference advice received
9 Reference advice received
10 Reference advice received
11 Reference advice received
12 Reference advice received
13 Reference advice received
14 Reference advice received

13 Financial assumptions

13.1 Discount rate

Guidance notes – Discount rate

Discount rate(s) to be used in construction of the PSC and in evaluating bids are to be derived in accordance with the methodology outlined in the *Discount Rate Methodology Guidance* and the latest parameter information advised by the relevant Treasury and/or Finance departments.

The PSC is presented in net present cost (NPC) terms. The NPC is based on the 'time value of money' concept and takes into account the effects of the timing of different cash flows over the project life by calculating the total net amount of all cash flows in equivalent present-day values.

The forecast nominal cash flows in the PSC are discounted to 1 July 2002. The NPC analysis is conducted using nominal cash flows discounted at a nominal discount rate of 7.62 per cent per annum. This nominal discount rate is based on a real, pre-tax rate of 5.00 per cent per annum and an inflation rate of 2.5 per cent.

An analysis of the sensitivity of the PSC to changes in the discount rate has also been undertaken (refer to Section 16.3).

13.2 Inflation

Guidance notes – Inflation

Guidance should be sought directly from the Relevant PPP Authority for inflation assumptions relating to long-term projects. The Relevant PPP Authority in this instance may include a number of public and private sector agencies in their estimation of the long-term inflation rate, e.g. Reserve Bank, Access Economics.

Assumed inflation rate of 2.5 per cent per annum and 3.5 per cent per annum for labour related costs.[15]

[15] As advised by the relevant Treasury and/or Finance departments.

13.3 Goods and services tax

Guidance notes – Goods and services

Government departments are entitled to claim back from the Australian Tax Office (ATO), any GST remitted. The Australian Tax Office advise that they aim to refund GST within 14 days of lodgement of the Business Activity Statement. The cost resulting from the timing lag between the remittance of GST and the ATO refund of GST is not considered material, and therefore, the PSC is calculated net of GST.

GST is paid on most services at a rate of 10 per cent and the Procuring Agency is entitled to a GST refund from the Australian Tax Office (ATO) for any GST paid.[16]

The ATO advises that GST refunds are paid within 14 days of the lodgement of the Business Activity Statement (BAS) (lodged on the 21st of each month). The BAS details the GST paid and received (if applicable) for the month. This indicates whether the entity is entitled to a refund or has to remit GST to the ATO. For the purposes of this exercise, the analysis assumes that the physical cash outflow due to GST occurs when the BAS statement is lodged every month, and the refund is received from the ATO in the middle of the following month, i.e. a one month time lag between payment and refund of GST for this project.

Analysis based on a review of the timing effect of GST on the reference project suggests that the effect of GST on the PSC is not material.

The Procuring Agency, as a GST-paying entity, may be able to offset various project GST payments/receipts against one another. For example, the GST paid on this project may be offset against any GST received from another Procuring Agency project. Therefore, the GST cash flow timing impact may differ where the project is considered within the Procuring Agency as a whole compared to the GST impact on the project as a stand-alone project.[17]

The GST cash flows were derived using the following general assumptions:

- Cash flows have been modelled on a monthly basis and GST cash flows have been assumed to be paid and received in the middle of each month.
- Nominal monthly GST cash flows have been obtained from the Project's PSC model, then multiplied by 10 per cent.
- Net GST cash flow for the month is calculated by adding the refund from the ATO and the GST paid for the month.
- NPC is calculated on the net GST for the month as at 1 July 2002.
- Cash flows were discounted based on an assumed real, pre-tax rate of 5.00 per cent per annum.
- At the assumed inflation rate of 2.50 per cent per annum, the real annual discount rate equates to a nominal rate of 7.62 per cent per annum.

[16] As advised by [insert name of consultant], GST specialist tax consultant
[17] As advised by [insert name of consultant], GST specialist tax consultant

The NPC (as at 1 July 2002) of the GST impact under a public sector delivery method is estimated at $**0.2 million** or **0.1 per cent** of the project's Raw PSC of $320.6 million. For comparative purposes, the NPC of the GST impact – assuming a service payment of $40 million per annum under a PPP private sector delivery method – is estimated at $0.2 million in NPC terms.

As noted, the results indicate that GST is not a material item in terms of overall project cost under a PPP project delivery method or under a public sector delivery method.

Given this analysis and bearing in mind that the Procuring Agency may be able to offset various projects' GST payments and/or remittances against each other, it is recommended that the value-for-money evaluation be based on the project's PSC and bidder's Proposals excluding GST. All numbers provided in this report are exclusive of GST.

Note that the RFP issued to private sector bidders should state that all costs are to be exclusive of GST unless otherwise notified.

14 The Raw PSC

Guidance notes – Raw PSC

This section of the report details the assumptions used and the source of the cost estimates to calculate the NPC of the Raw PSC. In this instance the assumptions are split into 'general' assumptions, 'capital' assumptions and 'operating' assumptions; however depending on the project, the assumptions may be split into other categories.

The results are presented as a table in the appropriate cost categories. There may be a requirement in some instances to include a section on changes to the final PSC from the PSC estimated at the business case stage.

The Raw PSC (example)

The costs for the project (including risk estimates) were provided by [insert sources of information]. [Insert name of financial adviser, other advisers i.e. quantity surveyor] understand that the costs have been based on the reference project as outlined in Section 3.2. In preparing the PSC and this report, [insert name of financial adviser] has relied on this cost information. A more detailed list of sources is provided in the Assumptions section of the financial model in Appendix C: Public Sector Comparator financial model - Simple risk evaluation method.

14.1.1 General assumptions

The capital expenditure and operating expense cash flows are derived based on the following general assumptions:

- The construction and commissioning period is two years commencing [insert date], followed by a 10-year operating period, commencing [insert date].
- All operating cash flows are assumed to be paid at the end of each period.
- Nominal cash flows increase, in line with forecast inflation, is assumed to be 2.5 per cent per annum, except for labour costs which are assumed to increase by 3.5 per cent a year.[18]
- All costs are exclusive of any GST.

[18] As advised by the Relevant PPP Authority

14.1.2 Project capital costs

[Insert name] provided the capital costs (refer report by [insert name]) based on the reference project assumptions in Section 12.3: The reference project and commercial development. The capital cost estimates are:

- Land acquisition and development is estimated to have a market value of $5.0 million.
- Base construction costs of the hospital building (based on the dollar cost of work rates per square metre using detailed drawings of the reference project and gross floor area) were estimated at $150.0 million as defined in the reference project. This includes the on-grade car park.
- Project design is estimated at $0.5 million.
- Payments to consultants for design and architectural services are estimated at $1.0 million.
- Cost escalation during the construction phase is estimated as in line with the CPI.

In addition:

- Plant and equipment were estimated by [insert name] at $50 million.
- Refurbishments are to occur in years 5, 8 and 11 based on three-year capital expenditure cycles post-construction, and are to be spread equally.
- Capital (upgrade/refurbishment) is estimated at 10 per cent of the base construction cost, incurred in year five, based on estimated lifecycle of specific items of capital equipment.

14.1.3 Project operating costs

Operating costs for the project have been estimated by [insert name] based on the following assumptions:

- Building maintenance and maintenance for plant and equipment are based on expected utilisation of the building and associated facilities produced by [insert name of source].
- The cost of wages and salaries is based on current and forecast wages and is inflated at CPI + 1 per cent which equates to 3.5 per cent per annum.
- Running costs for the hospital (i.e. electricity, gas, water, telephone etc.) were estimated at $2.0 million per year.
- The cost of insurance was estimates to be $1.3 million per year.
- Construction overheads which relate to the costs of managing the project during the construction period (including oversight of the construction contractor) were estimated at $1.0 million per year.
- Operating overheads relating to ancillary running costs not directly involved in the provision of the hospital or related infrastructure are estimated by [insert name] at $0.2 million per year.
- Administration overheads due to the cost of ongoing facilities and project management were estimated by [insert name] at $0.5 million per year.

- Indirect capital cost allocation for partial use of other government equipment and resources was estimated by [insert name] at $0.1 million per year.

- Third-party revenue was estimated by [insert name] at $5.0 million per annum. This relates to lease rentals related to the florist, car parking and patient TV services.

14.1.4 Raw PSC results (non-risk-adjusted)

Table 14-1 shows the Raw PSC split into construction cost and operating costs (NPC basis).

Table 14-1: Raw PSC – Construction and operating costs (net present cost)

Cost item	NPC $m
Direct construction costs	
Project design	0.5
Land acquisition and development	5.0
D&C contract price (incl. car park)	139.6
Payments to consultants	1.0
Plant and equipment	46.5
Capital improvement (incl. car park)	11.8
Refurbishment cost	27.3
Indirect construction cost	
Overheads	2.9
Total construction costs	**234.6**
Direct operating costs	
Hospital maintenance costs	30.0
Cost of materials	10.5
Wages and salaries	37.5
Other employee costs	7.5
Electricity etc.	14.0
Direct management costs	7.0
Insurance	8.8
Indirect operating costs	
Operating overheads	1.4
Administration overheads	3.8
Indirect capital cost allocation	0.7
Less third-party revenue	(35.0)
Total operating costs	**86.2**
Total Raw PSC (excl. GST)	**320.8**

Cost items in Table 14-1 are in NPC terms and will differ from numbers in Section 14.1.2. For example, the capital cost, $150m nominal (referred to in Section 14.1.2) corresponds to $139.6m in NPC terms.

15 Competitive Neutrality

Guidance notes

This section outlines the assumptions that form the Competitive Neutrality adjustment and explains the results. For further guidance on the application of competitive neutrality, refer to the relevant jurisdiction's Competitive Neutrality Policies

Competitive Neutrality (example)

Competitive Neutrality assumptions have been estimated by [insert name] and are based on the following:

- Land tax was estimated at $0.01 million per year.
- Local government rates were based on 0.87 cents per dollar of the value of the property.
- Stamp duty was estimated at $0.3 million.
- Payroll tax was based on 7 per cent of wages and salaries per year estimated at $0.4 million per year.

(Note these rates have been adopted in this example for illustrative purposes only.)

Table 15-1 details the NPC of the Competitive Neutrality adjustment.

Table 15-1: Competitive Neutrality adjustment (net presentation)

Cost item	NPC $m
Land tax	0.1
Local government rates	12.0
Stamp duty	0.3
Payroll tax	2.6
Total Competitive Neutrality	**15.0**

The Competitive Neutrality adjustment represents approximately 4.6 per cent of the non-risk-adjusted PSC. It shows that the majority of the adjustment relates to local government rates.

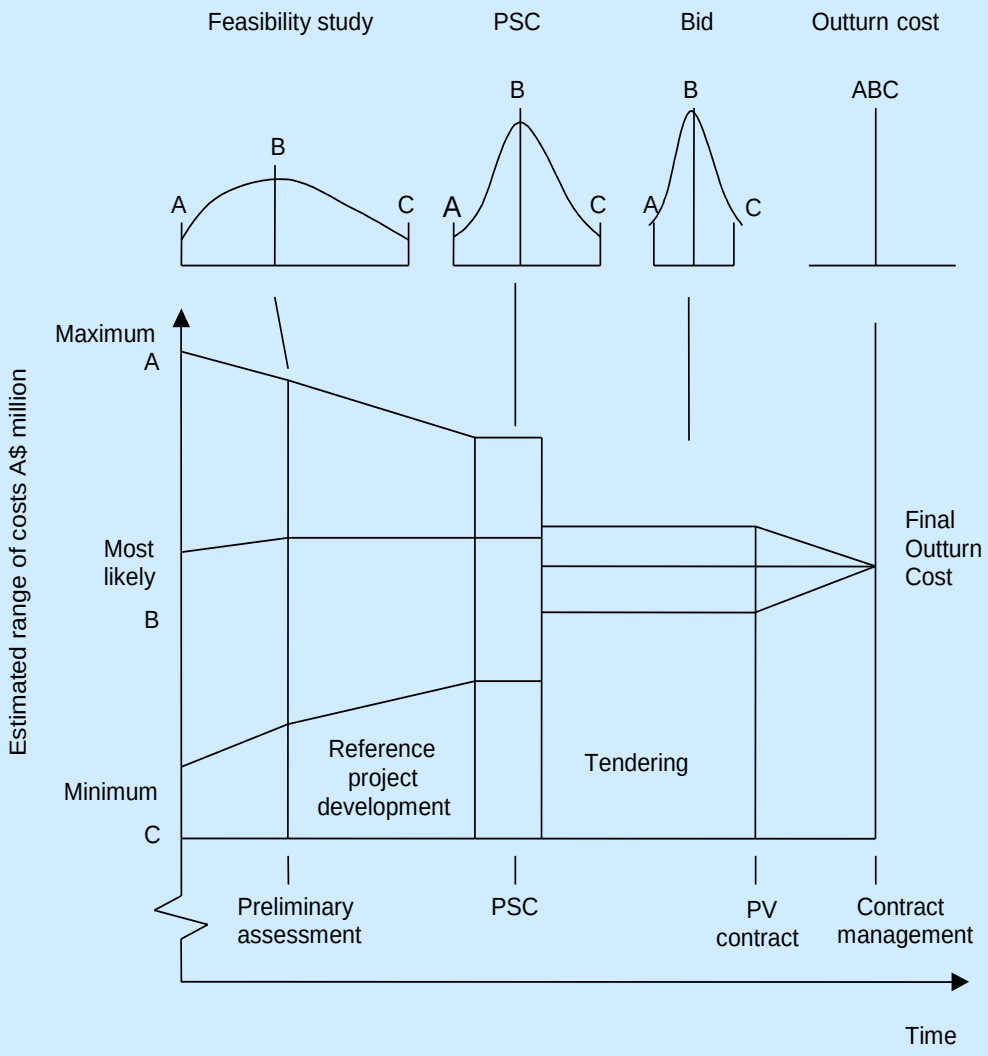
16 Identifying, allocating and evaluating risk

Guidance notes - Identifying, allocating and evaluating risk

For the PSC to provide a meaningful benchmark against which to compare private sector bids, it must include a comprehensive and realistic pricing of all quantifiable and material risks. However, it is also important to view the risk analysis required for the PSC as part of the broader process of identifying, allocating and managing project risks.

It is important to recognise that probabilities and uncertainties in cost prediction vary from stage to stage during the procurement process and therefore so do the measures of likely cost outcome and volatility.

Figure 16-1: Torpedo diagram of risk analysis and management



Guidance notes - Identifying, allocating and evaluating risk

Figure 2

This so-called 'Torpedo' diagram illustrates how the development of the reference project generally results in a better understanding of the risks associated with the project and a corresponding reduction in the spread of potential outcomes. The step-down between the PSC and the PPP contract represents the expected value-for- money outcome, albeit with some uncertainty associated with the Retained Risks. Final outturn cost will not be known until the end of the contract, but should lie within the range estimated when the contract was awarded.

The *Public Sector Comparator Guidance* identifies two quantitative techniques for valuing risk:

1. simple probability valuation techniques; and
2. advanced probability valuation techniques based on probability analysis.

A limitation of the simple probability technique is that it provides a single estimate for risk which is based on analysing risks independently of each other. The weighted effects of each risk are accumulated to provide the most likely outcome risk-adjusted PSC.

Though more complex, the more reliable technique involves applying probabilities to the risks and considering interdependencies between the risks. Probability analysis overcomes the limitations of the simple approach by specifying a probability distribution for each risk, and then considering the effects of the risks in combination. The result of the analysis is a **range of values** in which the final outcome could lie.

The expression of risk as a range of final outcomes is a far more useful tool for understanding government's exposure to risk volatility and demonstrating the robustness of risk transfer and management options. This information forms the foundation on which appropriate risk management strategies can be developed to mitigate and reduce government's risk exposure.

Adopting this technique for the project may also assist in the bid evaluation process where bids are close to the PSC. Under such circumstances, a fuller appreciation of government's exposure to volatility may assist in ranking the bids and lead to making a sound business case for proceeding with a preferred bidder even where marginal, or no financial benefit can be demonstrated based on the mean case for the risk-adjusted PSC. Risk volatility can be analysed by considering and comparing the respective risk profiles for the PSC and the bids generated from the advanced probability valuation technique. These distributions are commonly represented as histogram plots, or cumulative frequency graphs and are typically generated by statistical software.

For example, a PPP delivery mechanism may be preferred over the alternative PSC delivery, even if the private sector bid lies above the mean case, as the private party involvement would decrease government's exposure to downside volatility. Under such circumstances government obtains value-for-money (VFM) from a reduction in its exposure to the downside risk of cost increases exceeding those forecast.

When to use the simple technique and when to use the advanced technique

The *Public Sector Comparator Guidance* provides detailed guidance on determining the most appropriate risk valuation technique (see Section 6). It explains and provides examples of both these techniques. It also states that the technique adopted for a particular project, or a particular risk depends on the significance of the project and the complexity of the risks within it. Note that in the example, the advanced model includes

Guidance notes - Identifying, allocating and evaluating risk

more risks than the simple model for the same project. This is for illustrative purposes only.

When selecting a risk valuation technique, factors to be considered include:

- the relative impact of the risk on the project
- the size of the project
- the complexity of the project.

For example, a relatively simple project, such as a hospital car park, is unlikely to warrant sophisticated advanced probability valuation techniques whereas a more complex project, such as a hospital, may warrant such analysis. But even this example may be over simplistic as a hospital car park project may be structured to transfer significant usage risk to the private sector and for this risk it may be advisable to carry out a probability analysis on the volume projections.

16.1 Methodology

Guidance notes - Methodology

This section of the report should document the methodology adopted in carrying out the risk valuation on the PSC.

Methodology for project risks (example)

The methodology used to identify, allocate and evaluate project risks is outlined below. These steps helped to ensure that risks were systematically recorded and quantified for the project.

Step 1: Identify risks

Step 2: Categorise risks

Step 3: Estimate the likelihood of the occurrence of each risk

Step 4: Estimate the financial impact of the occurrence of each risk

Step 5: Allocate risks as transferred or retained

Step 6: Finalise the formation of the risk register

Step 7: Incorporate quantifiable risks into the PSC financial model discounted cash flow analysis.

The majority of the risk information was gathered and refined in five phases.

Phase One: Structured risk identification workshop

Phase Two: Structured risk quantification workshop

Phase Three: Further refinement of the risk quantification by risk experts

Phase Four: Risk review workshop

Phase Five: Risk modelling

The data gathered through this process is documented in the risk register which is contained in the PSC financial model.

16.1.1 Phase One: Structured risk identification workshop

Guidance notes - Structured risk identification workshop

Whatever risk valuation technique is used, before analysing and attempting to quantify the effect of risks on a project, the sources of risk must be identified first.

The risk identification process is probably the most important and useful part of the risk evaluation analysis. It benefits understanding of the project and its potential problems, as well as provoking thought about the appropriate management response to risks.

The identification of risks is best done using brainstorming. Good practice in brainstorming sessions is not described here. The purpose of the brainstorming should initially be purely to identify risks. There should be no quantification at this point. This is because quantification of risks is a complicated process and care must be taken to ensure that experts form their own views after some consideration of the identified risks in the context of the reference project and the Raw PSC. There is a danger that the group dynamics at the risk identification workshop/brainstorm session can give rise to conformism and thus a simplification of treatment and an underestimate, or overestimate of the level of risk. This is particularly the case if the quantification is done without sufficient preparation and forethought too early in the process. However, the identification of risks phase is less prone to these problems, and the creative benefits of group work early in the development of the PSC outweigh the dangers.

The aim after the brainstorming session is to ensure that all those attending leave with a common perception of the risks associated with the project and the risk experts understand what is required of them in the next stage – firming up the actual risk estimates of probability and cost. Depending on the stage of development of the project and time constraints, it is possible to complete both the risk identification and risk quantification workshops in the same day.

People who might be involved in the identification and quantification of risks are:

(i) 'core' service operational managers and stakeholders
(ii) Departmental stakeholders
(iii) the relevant PPP Authority representative/s
(iv) project managers
(v) technical consultants such as architects and design engineers
(vi) financial and legal advisers
(vii) the risk analyst.

Guidance notes - Structured risk identification workshop

A useful tool to help structure the thinking in the brainstorming session is a list of typical risks to which the project may be exposed. The *Risk Allocation and Standard Commercial Principles* guidance provides a useful starting point for developing this list.

Risk and outcome are often misunderstood. It is important to emphasise the key difference between these terms.

- An outcome is a consequence of a risk such as 'delay', 'cost overrun', under-performance'; and
- A risk is an event that causes the consequence, such as 'failure to grant a right of way', 'poor ground conditions', 'material defect'.

Accordingly, construction cost overrun' is not a risk and therefore should not appear on the risk register as an identified risk, but should be identified as a consequence of certain risk events.

The output from this stage should be incorporated into a risk register, including as a minimum:

- risks identified and categorised for ease of reference (individual risk identification tags can also prove useful for future reference);
- a rough cut of risk allocation; and
- a 'risk expert' identified for each risk, whose role is to further refine the preliminary analysis in terms of description, consequence, and numerical risk estimates in the following stages of the risk valuation process.

In allocating risks, the risk allocation principles in the *Risk Allocation and Standard Commercial Principles* guidance should be the basis. The PPP project delivery is committed to optimal rather than maximum risk transfer. Consequently the identifiable risks of the project should be individually valued and allocated to the party best able to manage them at the lowest cost to government. If a risk is to be retained by government it is classified as a 'Retained' Risk, while if the private sector would be better placed to manage the risk, it is classified as a 'Transferred' Risk.

Most importantly, the PSC needs to accurately reflect the performance standards specified in the output specifications and articulated in the key performance indicators (KPIs) and payment mechanism. A key risk in this regard concerns performance. Performance risk relates to the risk that the service provider will not meet the required service standards and, as a result, will have some, or all of their income (service payments) 'abated'. This is a known risk transferred to the private sector. It is usual, and acceptable, in such cases for a risk premium to be built into the tendered price – as for all other Transferred Risks. Although in reality, government is unlikely to abate payments to a government service provider (i.e. as typically assumed under the PSC), for a fair comparison to be made with bids, this risk needs to be built into the PSC.

It is often the financial adviser who is responsible for facilitating the risk workshop and coordinating the risk estimates from the risk experts.

Structured risk identification workshop (example)

The phase one workshop (risk workshop) was held at [ ] on [insert date] with the following representatives:

Department/Organisation	Attendees (participants) at the risk workshop
the Procuring Agency	[list names of participants]
the Relevant PPP Authority	[list names of participants]
[name of clinical operator]	[list names of participants]
[insert name of technical adviser]	[list names of participants]
[insert names of financial advisers]	[list names of participants]

The primary purpose of the risk workshop was to identify as many risks to the project as possible and allocate them between government and the PPP service provider. The risk allocation table prepared for the business case provided a useful reference for the risk categories and the high level risk allocation.

The aim was to identify the 'material risks' – the risks that could have a significant cost impact if they occur. Risks were also allocated, on a preliminary basis, according to the PPP principles. Finally, for each risk, an expert was identified as the individual responsible for further analysis of the risk through the remainder of the risk valuation process. [Insert name] coordinated the risk workshop and the collation of the risk estimates from the nominated risk experts.

16.1.2 Phase Two: Structured risk quantification workshop

Guidance Notes - Structured risk quantification workshop

The quantification of risk should be attempted only after the reference project and Raw PSC costing exercise have been completed. In the first instance, risks can be usefully quantified using workshop techniques after the risk experts have been given sufficient time to consider the likely impacts for the risks and probabilities. (Note that the key participants should attend all the risk workshops to ensure consistency in the estimates provided.)

There has been considerable analysis of the psychological factors at work in group dynamics, both in and out of workshop situations. Some of the dynamics to be considered when quantifying risks in a workshop situation include:

- **Conformity**: When a group of people estimate a risk, they tend to gain unwarranted confidence from each other's estimates and give a narrower range of estimates than if they worked on the issue independently.
- **Bias:** The more senior individual at the session is likely to influence the others merely by their presence. Most people will have a bias in a particular direction, but with a dominant person present, the biases will tend to converge.
- **Personality:** This is the usual issue of the loudest voice dominating, and the quietest not being heard.

To avoid some of the issues raised above, the preferred technique is to present preliminary analysis data to experts before the risk quantification workshop and use the session to discuss the level and logical structure of the uncertainty and correlations for the risks.

Simple and advanced valuation techniques

The most simple risk valuation technique is a subjective assessment of probability for each risk. Subjective assessments should, where possible, be based on past experience, current best practice, and likely improvements in the future, supported by reliable information where available. One of these techniques is the point estimate approach.

Guidance Notes - Structured risk quantification workshop

Those risks identified in the phase one workshops as 'material risks' should be discussed by the participants to provide an agreed assessment using either the simple or advanced valuation technique.

Simple valuation technique	Advanced valuation technique
Probability of occurrence	Probability of occurrence
Likely cost impact of various outcomes	Likely cost impact
	Maximum and minimum cost impacts

Quantifying risks in a workshop

To assist in quantifying risks, it may be useful to set some parameters around subjective descriptions of probability and impact as in this table.

Boundary	High	Medium	Low
Probability of occurrence	Greater than 60%	From 30% to 60%	Less than 30%
Impact on capital cost	Greater than $0.5m+	$0.25m to $0.5m	Less than $0.25m
Impact on recurrent cost	Greater than $50 000	$25 000 to $50 000	Less than $25 000

The risk workshop facilitator should ensure that every participant in the group is able to contribute to the discussion. Various techniques can be employed to ensure that each individual opinion is given equal consideration.

The real output of this workshop is the understanding of the risks and a general indication of where the risk would lie, i.e. the high, medium, low category. Participants at the workshop are only required to agree whether the risk should be classified as high, medium or low in terms of probability and cost impact and whether the cost impact is on capital expenditure, recurrent expenditure or both. This provides a useful guide for the risk experts who carry out the actual risk quantification in the following phase. This roundtable discussion brings together participants who will assess the risk based on their own expertise, e.g. engineering, architecture, core service operations, finance etc. This aids in a better understanding of the risks for those involved in the project and it acts as a guide for the risk expert.

The risk expert then looks more closely at the risk and places a probability on the risk, usually within the boundaries of the classifications of high, medium or low as assessed during the workshop. The risk expert nominated in the workshop also assigns a three-point distribution to the risk. If the risk eventuates, this three-point estimate represents the 'best case', 'most likely case', and 'worst case' scenario.

Risks that are difficult to quantify due to the high level of uncertainty of variables or the inherent nature of the risk, for example risk due to changes in the private party key personnel, should be classified and recorded as unquantifiable and qualitative in nature.

Phase two workshop (example)

The phase two workshop (structured risk quantification risk workshop) was held at [ ] on [insert date] with the following representatives [usually the same participants as the phase one workshop] attending from their respective departments and organisations:

Department/Organisation	Attendees (participants) at the risk workshop

the Procuring Agency	[list names of participants]
the Relevant PPP Authority	[list names of participants]
[name of clinical operator]	[list names of participants]
[insert name of technical adviser]	[list names of participants]
[insert names of financial advisers]	[list names of participants]

The primary purpose of the risk workshop was to categorise the identified risks as high, medium or low as follows:

Boundary	High	Medium	Low
Probability of occurrence	Greater than 60%	From 30% to 60%	Less than 30%
Impact on capital cost	Greater than $0.5m	$0.25m to $0.5m	Less than $0.25m
Impact on recurrent cost	Greater than $50 000	$25 000 to $50 000	Less than $25 000

Each risk was also analysed for correlations with any other risks.

16.1.3 Phase Three: Further risk quantification refinement by risk experts

Guidance Notes - Further risk quantification refinement by risk experts

The information from the two-phase risk workshop process provides a useful starting point for the risk quantification now carried out by the risk experts. Each expert arrives at a considered quantification of the risks after a short break to absorb the outcomes of the phase one and two workshops. There may be further structured interviews between the risk analyst and each expert.

As noted, probabilities and uncertainties in cost prediction vary from stage to stage in a project. Ideally the contingency and tolerance levels applied to risk at the business case stage of a project should give a reasonable indication of project risk. Then the cost tolerances should reduce as the project is developed and risks are better understood, reduced and removed.

Simple valuation technique

Risk experts should realistically assess how likely final costs are to be above,l or below the amount included in the Raw PSC. The number of point estimates used in valuing risk (each having a different expected consequence) should reflect the materiality of the risk and the information available. Where empirical evidence is unavailable or incomplete, commonsense approximations may be used.

Value of Risk = consequence x probability of occurrence

(The risk assumptions tables attached in the appendices for both the simple and advanced valuation techniques illustrate this formula.) The value of each risk is the sum of these probability weighted consequences (assuming that they are all independent), plus any contingency amount in the financial model which is to be attached.

The following probabilities and consequences have been estimated:

Assumption	Probability	Consequence	Value of risk

Guidance Notes - Further risk quantification refinement by risk experts

	%	$'000s	$'000s
Below base amount	20	(10 000)	(2 000)
No deviation from base amount	10	0	0
Overrun: likely	40	15 000	6 000
Overrun: moderate	20	20 000	4 000
Overrun: extreme	10	25 000	2 500
	100		**10 500**

Note: Base amount refers to the cost of the raw plant and equipment estimated in the Raw PSC of $50 million.

Timing of risk: Operating period from Year 3 to Year 12
Allocation of risk: Transferred to the private party

(For an example of how to model this risk in the PSC financial model, please refer to Appendix C: Public Sector Comparator financial model – Simple risk evaluation method. This risk is recorded in the Risk assumptions worksheet. The NPC modelling of this risk is in the Risk – Simple worksheet.)

Advanced valuation technique

By this stage the risk experts should be relatively comfortable with the task ahead. However, people often consider it more difficult to provide a probability distribution than they do a single point estimate. There are two components of uncertainty included in the distribution – the inherent uncertainty in the variable itself, and the uncertainty arising from the expert's lack of knowledge of the variable. In a risk analysis model these two are not differentiated. The combined uncertainty is entered into the model. Experts may be reluctant to include lack of knowledge in the analysis, but there is no alternative. (There is no perfect expert). Some suggestions for putting the expert at ease are:

1. Explain that providing a distribution for a variable does not require a greater knowledge of the variable than a single point estimate – quite the reverse. It gives the expert a means to express their lack of exact knowledge.

2. Reassure them that the estimation of a probability distribution does not require any great knowledge of probability theory.

3. Reassure them that the only expectation is that they are 90 per cent confident that the risk outcome will lie somewhere within their estimation of the risk.

4. Remind them that there will be an opportunity to revise the estimates at a later stage, particularly if they are found to be significant drivers of the overall risk.

Considerable reluctance can also be overcome by careful phrasing of the question. For example, if trying to elicit the rates of failure of an average contractor against a service requirement, it makes much more sense for a group of people to be asked 'Over the last 10 year period, how many failures have you had with your contractors?' and 'How good do you think your contractor is compared with the average contractor?' rather than 'What is the rate of failure of an average contractor?'.

Guidance Notes - Further risk quantification refinement by risk experts

Defining distributions

A probability distribution describes a probability that a variable will have a given value or occur within a given range. The fact that the area under the graph of a probability distribution is equal to one means that the cost will fall within the range of costs shown on the graph. There are many standard distributions available within Monte Carlo analysis software.

1. The most commonly used distribution for modelling project risk is the triangular distribution, based on a three point estimate of cost outcome. It is a popular distribution to use as it is very simple and clear and can be used when there is little, or no statistical information on a variable's distribution. Note that it overestimates the tails of outcome at the expense of values close to the mean. Related to the triangular distribution is the truncated triangular distribution which can be used to place confidence levels (e.g. 5 per cent and 95 per cent) on the best case and worst case estimates. Where this distribution is used under simulation, values that fall outside of these estimates may be selected by the Monte Carlo analysis.

   Triangular distribution is frequently used in situations where the actual distribution is not known.

2. Normal (Gaussian) distribution is another frequently used distribution, in part because of the central limit theorem which states that the mean of a set of values drawn independently from the same distribution will be normally described. Many natural variables fall into a normal distribution, such as human heights, horse weights etc. A normal distribution is suitable where a distribution is not known, but it is understood to be symmetrical about a mean value, and more likely to be near the centre than at the extremes.

3. Uniform distribution is used where the variable is bounded by a known maximum and minimum value and all values in between occur with equal likelihood. In common with triangular distribution, this has the advantage of being intuitively obvious and highlights the risk where there is little, or no statistical information about its distribution.

4. Other distributions that are infrequently used to describe project risk, but may be relevant for a particular risk include:

   - binomial (based on a number of trial events and the known probability for each trial – the simple valuation technique of point estimates is based on this distribution)
   - Poisson (describes the number of events that will occur in a given unit of time, given that the rate is known)
   - exponential (describes the amount of time between occurrences)
   - log normal (useful for representing quantities that vary over several orders of magnitude).

Phase Three – Expert risk analysis (example)

The risk experts were required to further investigate the probabilities and cost impacts using the workshop guidelines. The aim was to refine the impacts to provide an estimate of the cost impact and a probability of the risk occurring.

These estimates represent the range of values where the risk expert would be 90 per cent confident that the cost impact would lie within the range specified. In other words, there is a risk that the cost could lie outside the range.

16.1.4 Phase four: Risk review workshop

Guidance notes - Risk review workshop

The phase four risk review workshop applies to both the simple and advanced methods of valuing risk. The purpose of the risk review workshop is to:

- identify and further assess risks missed in the process to date
- confirm the proposed risk allocation
- run a sanity check of the risk estimates provided by the risk experts
- formulate risk management and mitigation strategies.

At the end of the fourth phase risk workshop, the risk register should be effectively signed off by the participants so that the risk modelling exercise can be completed and incorporated into the PSC.

The phase four workshop was held at [ ] on [insert date] with the following representatives attending from their respective departments and organisations:

Department/Organisation	Attendees (participants) at the risk workshop
the Procuring Agency	[list names of participants]
the Relevant PPP Authority	[list names of participants]
[name of clinical operator]	[list names of participants]
[insert name of technical adviser]	[list names of participants]
[insert names of financial advisers]	[list names of participants]

The primary purpose of the risk workshop was to run a risk sanity check, confirm the risk estimates and formulate risk management and mitigation strategies.

16.1.5 Phase five: Risk modelling

Guidance notes - Risk modelling

This section concentrates on the risk modelling exercise after the risks have been quantified.

The first consideration in designing the model is how the risks should shape the structure of the model. For example, a cash flow model might be normally modelled in yearly units; however, the risks may well be quite different in summer than in winter. For the risk analysis it makes much more sense to separate the years into halves or quarters. This is a matter of judgement, but in large risk projects simple prototypes are constructed with different levels of detail to see what the impact the model structure has on the outputs. Another factor to consider in structuring the model is the timing of the risks and when they are likely to occur.

Simple valuation technique

The *Public Sector Comparator Guidance* provides an example of the simple valuation technique, and this guidance material provides an example in the financial model (simple risk valuation) in Appendix C. The risks are modelled from the risk estimates detailed in the Risk assumptions worksheet and are categorised into retained and Transferred Risk. In this example, timing flags are used to model the risks. However, other modelling techniques are available which can achieve the same result.

Advanced valuation technique

Monte Carlo simulation works by selecting a random value within the described probability distribution such that, over a large number of iterations, the distribution of the selected values reflects the input probability distribution. For example, if there a discrete distribution with a 20 per cent chance of a '0', a 50 per cent chance of being '1' and a 30 per cent chance of being '2', for each iteration the simulator will select either '0', '1' or '2', and after a large number of iterations, approximately 20 per cent of the values will have been '0', approximately 50 per cent '1' etc.

As mentioned in passing above, the accuracy of the estimates of the output parameter (i.e. the particular risks or risk category) depends on the number of iterations, and not the number of inputs, as the greater the number of iterations (as described above), the more likely an output distribution is formed with the risk probability estimates as described by the risk expert. Also Monte Carlo simulation, unlike most simpler methods, does not require that the relationships between the inputs and outputs are linear, i.e. do not involve division, multiplication or IF statements. It is for these two reasons that it is such a powerful and widely used method.

Example of risk quantification - advanced valuation technique

This is an example of how a risk is quantified for the advanced valuation technique.

(a) Phase one and two: A risk identified during the initial risk workshop is ‘risk of adverse geological ground conditions’. The workshop participants assessed this risk as having a ‘low’ probability of occurrence and ‘high’ capital cost impact if the risk were to eventuate. The risk was assessed as a Transferred Risk under a PPP methodology.

Guidance notes - Risk modelling

(b) Phase three and four: The risk expert undertook a further review of the risk and placed it within the 'low' probability range at 15 per cent probability of occurring. Its three-point estimate of 'best case' 'most likely case' and 'worst case' were $300 000, $375 000 and $700 000. Note that this estimate straddles the 'high' and 'medium' boundaries set in the risk workshop. The risk expert estimates that the risk would occur once (or it may not at all) during the construction phase, i.e. if the risk were to occur at the beginning of the construction phase, it would not occur again.

(c) Phase five: These details are entered into the risk register as shown in the Risk assumptions of the worked example financial model (advanced risk valuation method, refer to Appendix D).

The worked example shows that when the risk simulation is run, this risk will only occur once (if at all) during the construction period. During simulation the Monte Carlo function will select a value of zero 85 per cent of the time. The remaining 15 per cent of the simulation runs will be a value from the distribution as described by the risk expert.

The outputs of the simulation in this worked example are the NPC of the Retained Risks and Transferred Risks in total, as the PSC is expressed as retained and Transferred Risk shown in total. However, it is possible to select every risk as an output from a Monte Carlo simulation if required.

Risk modelling report (example)

Once the risks were identified and quantified, a cost model of the project was developed containing all the elements of the PSC. This model incorporated a Monte Carlo spreadsheet developed using the @RISK software package and Microsoft Excel. Monte Carlo is defined as 'the traditional method of sampling random variables in simulation modelling. Samples are chosen completely randomly across the range of the distribution, thus necessitating large numbers of samples for convergence for highly skewed or long tailed distribution'.[19]

Random (Monte Carlo) sampling is used in probability analysis in the following way:

- The range of values for the risks being considered is estimated and a suitable probability distribution of each risk is chosen. Given the 'best case', 'most likely case', and 'worst case' cost estimates by the risk experts, these estimates were input into the PSC financial model as a 'TRIGEN' distribution. This is defined as a triangular distribution with three points representing the value at the 5th percentile, the 50th percentile and the 95th percentile.
- During each iteration, a value for each risk is randomly chosen within the estimated probability distribution by the @RISK software.
- The NPC of all the risks is calculated combining the values of each individual risk (or the NPC of each risk if each risk is nominated as an output in @Risk).
- The calculation is repeated a number of times to obtain the probability distribution of the risks in the PSC. One thousand repetitions were used to make sampling bias insignificant.
- Cash flows are then discounted at government's discount rate as per the Raw PSC.

[19] @RISK, *Advanced Probability Risk Analysis for Spreadsheets*, Version 4, Palisade Corporation, NY, USA, April 2000, p. 433.

16.2 Risk valuation

Guidance notes - Risk valuation

The risk analysis model is of no value unless its result can be communicated. This is necessary not only in presenting the final results, but also in presenting the interim results used to more accurately quantify the significant risks. This section is divided into graphical presentation and statistical measures of risk.

Graphical presentation

Histogram plots/frequency distributions are the most commonly used plots in risk analysis. The only consideration in histogram plots is the number of bars. Too many bars and the level of random noise dominates, making the plot too detailed and difficult to read. However, too few bars and the detail is missed out.

The histogram is very useful for illustrating the degree of uncertainty associated with a variable. However, it is not good for determining quantitative information. The cumulative frequency plot is useful for this – for example, for plotting the probability of achieving a certain NPC outcome, or the probability of a value lying between two values.

A histogram plot/frequency distribution will show the shape of a distribution and helps to show clearly where the majority of risks lie. Detailed analysis and comparison of the respective distributions generated for the PSC and the bids should be carried out as part of the documentation of the PSC and the bid evaluation. It is possible that such analysis could result in a bid that lies above the PSC mean case still being considered to show value for money in comparison with the PSC simply because the PPP delivery mechanism provides greater cost certainty and decreases government's exposure to downside risk volatility.

Consideration of the histogram plots/frequency distributions may extend to an analysis of measures such as the skewness, kurtosis and variance from the mean. These statistical measures, along with others, are defined and described in Table 16-1.

Statistical measures

There are many statistics that can be calculated based on a distribution – for example, the standard deviation of a normal distribution. Most of these statistics are unlikely to have any direct relevance to an output report. Table 16-1 lists the most common statistical measures, and explains when they might be useful.

Guidance notes - Risk valuation

Table 16-1: Statistical measures – definitions

Statistic	Definition	Use	Dangers
Mean (expected value)	The average of all the generated outputs	Very useful, for example, as a measure of the average NPV of a transaction. It also has the useful property that if two (or more) variables are independent, then: mean(a+b)=mean(a)+mean(b), and mean(a*b)=mean(a)*mean(b).	Confusing the mean with the most probable (mode)
Standard deviation (σ)	The square root of the variance	Another very useful statistic, it gives a measure to the dispersion around the mean of a distribution. It is frequently used in conjunction with normal distributions to give the level of certainty that a value lies within a certain amount from the mean: +/- σ of the mean = 68% +/- 2σ of the mean = 95% +/- 3σ of the mean = 99.7% So, for example, a normally distributed variable with a mean of 1.0 and a σ=0.05 can be said to have a 95% certainty of lying between 1.1 and 0.9.	(a) Assuming that the standard deviation of the sum of independent components is the sum of the separate standard deviations. In fact, it is the square root of the sum of the squares: $\sigma^2_{Tot}=\sigma^2 1+\sigma^2 2$ (b) The relationship given in (a) is only valid if the distribution is symmetrical. It becomes more of an approximation the more skewed the distributions are.
Variance (V)	The variance is calculated by determining the mean of a set of values, and then summing the square of the difference between the value and the mean: $V = \frac{\sum_{i=1}^{n} (xi-mean(x))^2}{(n-1)}$	This is also a measure of the dispersion around the mean. However, it is in the units of a quantity squared. Thus the variance of a distribution in NPV (in \$s) will be given in $\$^2$. It is useful for estimating the widths of a sum or multiple of several independent variables: V(a+b)=V(a)+V(b), and V(a*b)=V(a)*V(b).	As with standard deviation, the relationships shown to the left are only valid if the distribution is symmetrical. It should be noted that the variance (and thus the standard deviation) is much more sensitive to the values at the tails of the distribution than those close to the mean.
Median	The median is the value at which there is an equal percentage chance of a variable being above it as below it. In other words, it is the 50th percentile.	Rarely used as it gives no indication as to the range of the values above it or below it. If the mean is not equal to the median, then the distribution is skewed.	Confusing the median with the mean or mode.

Guidance notes - Risk valuation

Percentiles	The n^{th} percentile of a variable is that value for which there is an n% chance of the variable lying at or below that value.	A useful concept, used in measuring the range of a variable. For example, the range of a distribution might be defined as the difference between the 5^{th} and 95^{th} percentile. What this means is that the range here is the resulting width of a distribution if the top 5% and bottom 5% of all values are ignored. It can also be used to answer questions like 'What are the chances that the NPC is below $100 million?'. The answer would be the percentile for which the value was $100 million.	Not widely understood, so use everyday terms when quoting it.
Mode	The most likely value. For a discrete distribution this is the value with the greatest observed frequency, and for a continuous distribution the point of maximum probability.	Sometimes used to describe a Poisson-like distribution: the mode is the most probable event to occur in the given time period (and is approximately given by the reciprocal of the rate). Also used in describing triangular distributions (the minimum, the mode and the maximum). In general it has little value in uncertainty and risk analysis.	It is difficult to determine precisely, particularly if a distribution is unusually shaped.
Skewness (S)	$S = \frac{\sum_{i=1}^{n} (xi - mean(x))^3}{\sigma^3}$	This is a measure of the 'lopsidedness' of a distribution. It is positive if a distribution has a longer right tail (and negative if a more prominent left tail). Zero skewness means the distribution is symmetric. It is used to determine how 'normal' a distribution is. The closer a distribution is to having a skewness of zero, the more normal it is. Examples of skewness: the skewness of normal distribution is 0, triangular distributions vary between 0 and 0.56, and an exponential distribution has a skewness of 2.	The skewness is even more sensitive to the points in the tail of the distribution than the variance. It, therefore, requires many iterations to be run before it reaches a stable value.
Kurtosis (K)	$K = \frac{\sum_{i=1}^{n} (xi - mean(x))^4}{\sigma^4}$	The kurtosis is a measure of the 'peakedness' of a distribution. Examples of kurtosis: uniform distribution has a kurtosis of 1.8, triangular (2.4), normal (3), and exponential has a kurtosis of 9. If a distribution is approximately bell shaped, and has a skewness of around 0 together with a kurtosis of close to 3, then it can be considered normal.	Stable values of the kurtosis often require even more iterations to be run than skewness. For example a randomly sampled normal distribution required approximately 1500 iterations to be within 2% of 3.

Guidance notes - Risk valuation

Coefficient of variability (normalised standard deviation) σ_n	This is defined as the standard deviation divided by the mean: $\sigma_n = \sigma$ / mean	This is a dimensionless quantity that allows you to compare, for example, the large standard deviation of a large variable with the small standard deviation of a small variable. An example would be investigating the comparative level of fluctuation with time between different currencies.	This is not a meaningful statistic to compare if the mean and standard deviation are unlikely to bear any relation to each other. An example would be the NPV of a project. Here the spread need not be related to the mean value, which could be close to zero. An extreme would be the coefficient of variability of a normal distribution that is centred on zero.

In general, it is more helpful to keep the number of statistics quoted in a report to a minimum (e.g. the mean and the spread between two percentiles), and not quote them to a large number of significant figures.

16.2.1 Simple valuation method

Guidance notes – Simple valuation method

Please note that the percentage of risk as a proportion of the total PSC in the simple and advanced evaluation technique worked examples below are for illustrative purposes only, and each project will have different risk proportions.

Simple valuation technique (example)

The results using the simple valuation technique are detailed in Table 16-2.

Table 16-2: Risk-adjusted project cost (simple valuation method)

	NPC $m	% of risk-adjusted PSC
Total non-risk-adjusted project cost (incl. Competitive Neutrality but excl. GST)	335.8	72
Retained Risk	11.1	2
Transferred Risk	119.4	26
Total risk-adjusted project costs (excl. GST)	**466.3**	**100**

Table 16-2 shows that Retained Risk represents two per cent of the total risk-adjusted PSC. This comprises regulatory risk and maintenance risk relating to patient areas which were allocated as a Retained Risk to government.

The majority of risks are transferred and represent 26 per cent of the risk-adjusted PSC, with total project risk estimated to be 28 per cent of the total cost of the project. The major Transferred Risks are risk of construction cost overrun, the risk of time overrun and the risk of technical obsolescence which represent 25 per cent, 12 per cent and 9 per cent respectively of total Transferred Risk.

16.2.2 Advanced valuation method

Table 16-3 details the results of the advanced probability analysis expressed as the mean outcome from the risk simulation.

Table 16-3: Mean of risk-adjusted project costs (advanced probability analysis)

	Mean	% of risk-adjusted PSC
Total non-risk-adjusted project cost (incl. Competitive Neutrality but excl. GST)	335.8	72
Retained risk	12.8	3
Transferred risk	116.0	25
Total risk-adjusted project costs (excl. GST)	**464.6**	**100**

The cost of risks contained in the table above are mean (i.e. weighted average) estimates among a range of possible outcomes. It is, therefore, important to focus on the probability distributions generated by the advanced probability valuation technique rather than simply looking at the mean result in isolation. The best way to analyse these results is by looking at the total risk distribution and the shapes of the distribution curves for both retained and Transferred Risk and for 'Total PSC minus Retained Risk''.

Table 16-4 contains the results of the risk simulation from the 5th to the 95th percentiles and also includes the P90 range, or 90 per cent confidence limit, within which the cost of risk is likely to fall. Table 16-4: Simulated costs of risks, 5th to 95th percentiles:

Risk results			
Percentile	**Retained $'000s**	**Transferred $'000s**	**Total $'000s**
Mean	12 791	116 010	128 801
5%	2 291	46 078	56 329
10%	4 098	61 217	71 251
15%	5 216	71 165	82 733
20%	6 136	78 973	92 581
25%	7 052	86 417	98 886
30%	8 022	92 694	105 054
35%	8 785	97 706	110 774
40%	9 689	103 672	117 689
45%	10 418	108 828	122 139
50%	11 306	115 159	127 462
55%	12 668	120 361	132 015
60%	13 989	125 415	137 541
65%	14 914	130 194	144 029
70%	16 285	137 021	150 535
75%	17 502	144 966	159 032
80%	18 931	154 584	166 845
85%	20 926	163 535	176 043
90%	23 211	173 037	186 797
95%	27 026	188 877	202 202
P90	24 735	142 799	145 873

The raw statistical data generated by the advanced valuation technique and contained in Table 16-4 forms the basis for the histogram/frequency distribution plot which shows the overall shape of the risk distributions and is far more useful than the raw data for analysing risk. These charts are the most useful output from the advanced valuation technique. They show the frequency of a particular risk value in graphical form. This can be used to compare government's overall exposure to risk under the PSC with bids received.

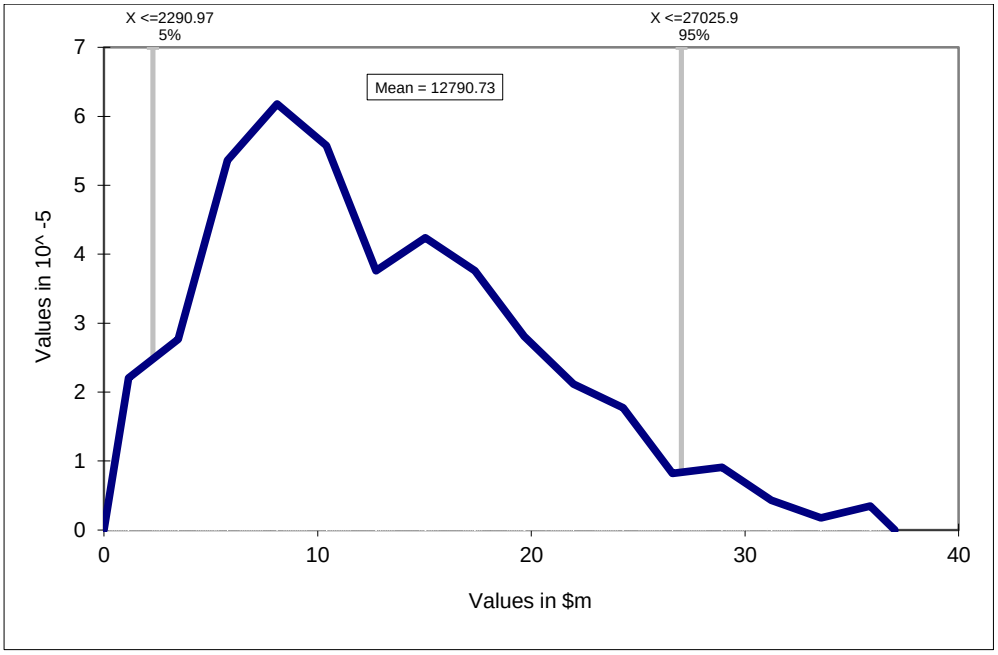
Guidance notes – P90 confidence limit

A common measure is the P90 confidence limit, defined as the difference between the 5th and 95th percentiles. The P90 describes the range in which the final project cost could lie, under a traditional government delivery, with 90 per cent confidence. While the P90 is a useful measure to illustrate the relative volatility of the PSC with, for example, PPP bids received from the private sector, it is the shape of the distribution which is most important. The focus of the analysis therefore, should be on the shape of the risk distribution as a whole, and where the major transferred or retained project risks lie. Consequently, no greater weight should be given to the mean, 5th or 95th percentile results than any other percentile result in the distribution.

Note that the P90 range presented in this worked example is for illustrative purposes only, and each project will have its own risk profile and statistical measures (including P90) specifically related to the nature and quantum of the associated risks (both retained and transferred). The P90 range differs from project to project and is also likely to narrow as the PSC is refined, as illustrated by the Torpedo diagram. Figure 16-1, at the beginning of this chapter.

Figure 16-3 illustrates the frequency distribution for Retained Risk, detailing the mean, the 5th and 95th percentiles. The 5th and 95th percentiles are included to illustrate the P90 range or 90 per cent confidence limit within which the cost of Retained Risk is likely to fall. In this case, the P90 is approximately $25 million (i.e. between $2 million and $27 million.

Figure 16-3: Retained risk frequency distribution and mean



The peak (or the most frequently occurring value during the Monte Carlo simulation) for Retained Risk is approximately $8 million; however the mean is $12.8 million due to the heavily skewed distribution. This reflects the skewed cost estimates provided by the individual risk experts for the risks, where, for the majority of risks, the 'most likely case' cost impact is skewed towards the 'best case' cost impact.

Figure 16-4 illustrates the frequency distribution for Transferred Risk, detailing the mean and, for illustrative purposes, the 5th and 95th percentiles.

Figure 16-4: Transferred risk frequency distribution and mean

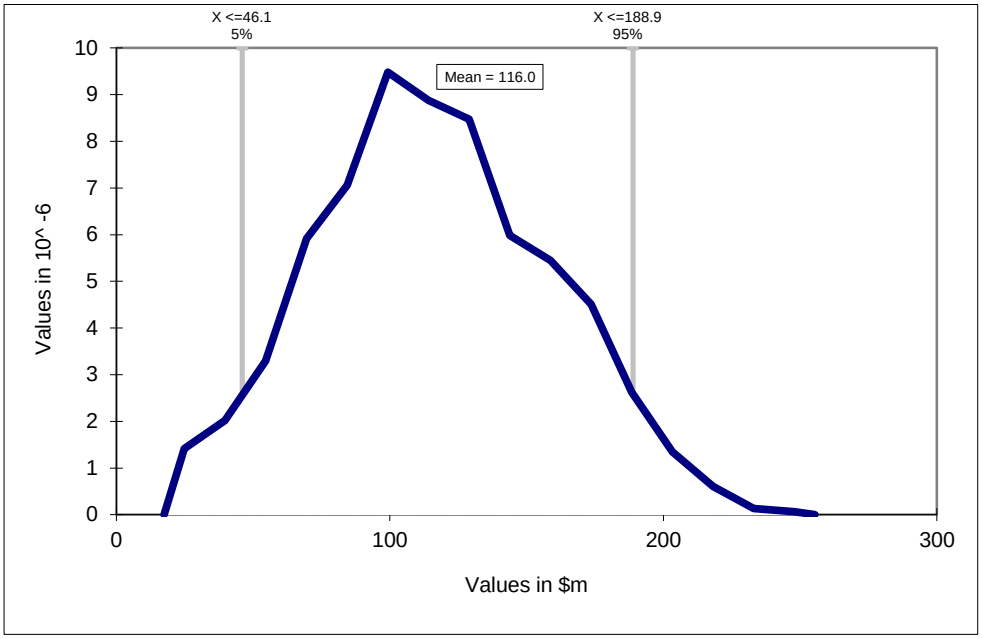


Figure 16-4 shows the frequency of distribution of Transferred Risk. For example, the most frequently occurring value during the simulation is around $100 million; however the distribution shows that Transferred Risk could have a cost impact of over $190 million at the 95th percentile (although the probability of this occurring is relatively low). This distribution shows a positively skewed profile, although this is not as pronounced as with the Retained Risks.

Guidance notes - Retained risk

A knowledge of the Retained Risk probability distribution is important to assist government in providing for, and managing, such risks. However, given that Retained Risk, by definition, is always held by government, it will not be a consideration in assessing whether bids offer value for money in comparison with the PSC (assuming that bids are not based on a different scope of Retained Risk.

Accordingly, the focus for bid evaluation purposes will be the probability distribution for Transferred Risk transposed onto the Raw PSC and Competitive Neutrality adjustment (i.e. the risk-adjusted PSC minus Retained Risk).

Figure 16-5 illustrates the frequency distribution for the Total PSC minus Retained Risk detailing the mean and, for illustrative purposes, the 5th and 95th percentiles. Of the charts produced, this is the most useful and will be the key benchmark against which PPP bids will be evaluated.

Figure 16-5: Frequency distribution – Total PSC risk distribution less Retained Risk

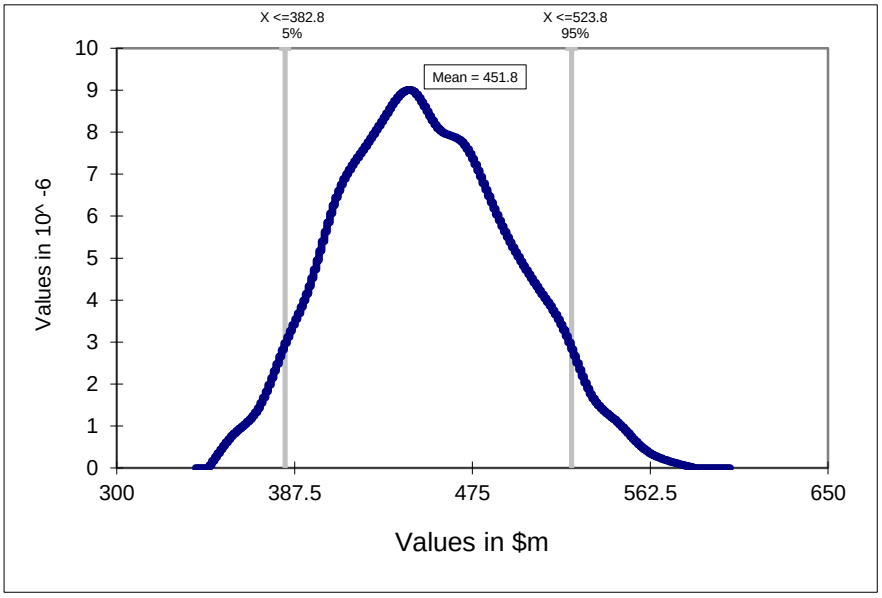


Figure 16-5 shows a positively skewed distribution for this particular project. The most frequently occurring value during the simulation is at around $445 million; however the distribution shows that the PSC (minus Retained Risk) could have a cost impact of $524 million at the 95th percentile (although the probability of this occurring is relatively low).

Note that Figure 16-5 only shows a slightly skewed distribution for this particular project. The slight skewing reflects the dominance of Transferred Risks (also only slightly skewed – see Figure 16-4) over Retained Risks (heavily skewed – see Figure 16-3) which is also shown in the quantum of the respective means.

Guidance notes - valuation methods

The lower risk-adjusted PSC under the advanced evaluation method at the mean case ($464.6 million) was purposely derived to be lower than the risk-adjusted PSC under the simple evaluation technique ($466.3 million) in order to illustrate this worked example. Depending on the risk estimates provided by the risk experts, it is also possible for the risk-adjusted PSC using the advanced technique to be higher than the risk-adjusted PSC under the simple technique.

The advanced technique provides a more accurate picture of the risks associated with a project, as the derivation of the risk estimates themselves means that the project risks are looked at more closely. A Monte Carlo simulation more accurately calculates the risks over a large number of simulations which reflects reality to a greater degree than the calculation of risk under the simple valuation technique.

16.3 Sensitivity analysis

Guidance notes - Sensitivity analysis

A simple sensitivity analysis of the major components that form the PSC is a useful way of understanding the impact of changes in these variables on the overall NPC of the project. Examples of variables that may be part of a sensitivity analysis include:

- capital costs
- operating/recurrent costs
- discount rate
- inflation rate
- maintenance and refurbishment costs.

A graphical representation of the results is a good, if limited, way of illustrating, the relationship of a particular cost to the overall cost of the project. A 'spider' diagram graphs the costs relative to one another, with the X axis detailing the percentage change in the cost, and the Y axis detailing the effect of the change on the PSC. Therefore, on the graph, the steeper the gradient of the line, the more sensitive is the total PSC to changes in the particular variable, compared to the other costs tested.

Note that these results should be reviewed with some caution because each cost is analysed separately. In reality, these costs are often dependent on each other. A sensitivity analysis follows on the PSC simple valuation technique and advanced valuation technique to illustrate the results under both techniques. Only one technique would be applied to a project at any one time.

16.3.1 Sensitivity analysis – Simple valuation technique

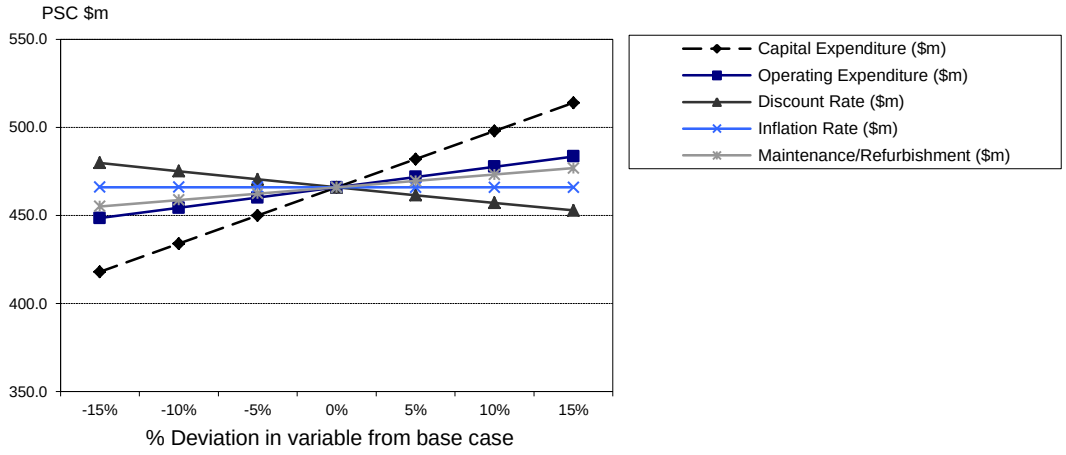
A limited sensitivity analysis has been undertaken for the Total Project PSC (i.e. including Retained Risk), on the main cost components of the Risk Adjusted PSC so as to understand the effect that movement in these costs will have on the cost of the Project. The results of this analysis are detailed in Table 16-5.

Table 16-5: Sensitivity analysis of the effect of movement of cost components on project cost

	PSC NPC $m				
Movement in assumption	**Capital cost**	**Operating cost**	**Discount rate**	**Inflation rate**	**Maintenance and refurbishment**
-15%	418.1	448.6	479.9	466.1	455.2
-10%	434.1	454.4	475.2	466.1	458.8
-5%	450.1	460.2	470.6	466.1	462.5
Base case	**466.3**	**466.3**	**466.3**	**466.3**	**466.3**
5%	482.1	471.9	461.6	466.0	469.7
10%	498.0	477.7	457.2	466.0	473.3
15%	514.0	483.5	453.0	466.0	477.0

Figure 16-6 shows how change in the key variables for the model (mentioned above) impacts on the total risk-adjusted PSC. Steeper gradients indicate that the NPC of the PSC is more sensitive to changes in this variable than to other variables tested.

Figure 16-6: Sensitivity chart – Impact of changes in variables on the total risk-adjusted PSC



This analysis indicates the following:

(i) Project capital costs

Every 5 per cent change in the capital cost of the Project, produces a change of approximately $16 million in the total project cost. Figure 16-6 above shows a steeper gradient for this cost compared with the other variables being tested. This means that the total PSC is more sensitive to changes in this variable than to changes in other variables. This result corresponds with the significant proportion of the total PSC which relates to capital costs, i.e. 51 per cent.

(ii) Project operating costs

Figure 16-6 shows that the PSC is less sensitive to changes in project operating costs than changes to the project capital costs, illustrated by the flatter gradient. Every 5 per cent change in the base operating cost produces a $6 million change approximately in the total PSC.

(iii) Discount rate

Figure 16-6 clearly illustrates the inverse relationship between the discount rate and the NPC of the project, i.e. the larger the discount rate, the lower the NPC. The gradient of this line indicates that for every 5 per cent increase/decrease in the discount rate, the change in the PSC is approximately $5 million lower/higher than the base case.

(iv) Inflation rate

The flat gradient shows that a 5 per cent change in the inflation rate has minimal effect on the overall PSC, which suggests that the PSC is not sensitive to changes in this variable.

(v) Maintenance and refurbishment costs

An increase/decrease of 5 per cent in this cost produces a corresponding increase/decrease of nearly $3 million on the total PSC, but as can be seen on the graph, the gradient of this cost is flatter than for the other variables tested, except for inflation. This suggests that the PSC is less sensitive to maintenance and refurbishment costs relative to the other costs tested, except for inflation.

In summary, the project PSC is more sensitive to movements in the project's capital cost compared with other variables. These results should be reviewed with some caution because each variable is analysed separately. However, in reality these costs are often dependent on each other.

16.3.2 Sensitivity analysis – advanced valuation technique

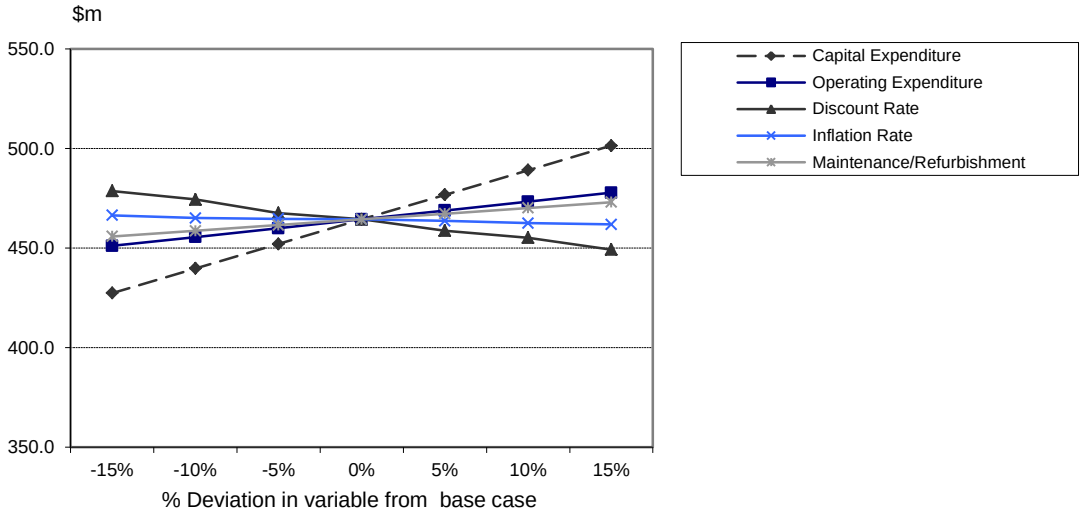
A limited sensitivity analysis has been undertaken for the project PSC on the main cost components of the risk-adjusted PSC so as to understand the effect that movement in these costs will have on the cost of the project. The results of this analysis are detailed in Table 16-6 below. Note that for the purposes of this exercise, the mean case has been used as the base case.

Table 16-6: Sensitivity analysis of the effect of movement of cost components on project cost–mean case basis

	PSC NPC $m				
Movement in assumption	**Capital cost**	**Operating cost**	**Discount rate**	**Inflation rate**	**Maintenance and refurbishment**
-15%	427.4	451.1	478.6	466.5	455.8
-10%	439.7	455.5	474.4	465.1	458.7
-5%	452.1	460.0	467.5	464.6	461.5
Base case	**464.6**	**464.6**	**464.6**	**464.6**	**464.6**
5%	476.7	468.8	458.7	463.7	467.3
10%	489.1	473.3	455.2	462.5	470.1
15%	501.4	477.7	449.2	461.9	473.0

Figure 16-7 shows how a change in the key variables for the model (mentioned above) impacts on the total risk-adjusted PSC. Steeper gradients indicate that the NPC of the PSC is more sensitive to changes in this variable than to other variables tested.

Figure 16-7: Sensitivity chart – Impact of changes in variable on the total risk-adjusted PSC (mean case basis)



Note that the slight kink in the graph is primarily is due to the simulation effects of running @Risk when using the advanced valuation technique for each change in the discount rate and inflation rate. The overall trend of the graph should be reviewed rather than individual movements.

This analysis indicates the following:

(i) Project capital costs

Every 5 per cent change in the capital cost of the project produces a change of approximately $12 million in the total project cost. Figure 16-7 shows a steeper gradient for this cost compared to the other variables being tested. This means that the total PSC is more sensitive to changes in this variable than to changes in the other variables. This result corresponds with the significant proportion of the total PSC which relates to capital costs, i.e. 51 per cent.

(ii) Project operating costs

Figure 16-7 shows that the PSC is less sensitive to changes in project operating costs than changes to the project capital costs, illustrated by the flatter gradient. Every 5 per cent change in the base operating cost produces $4 million change approximately in the total PSC.

(iii) Discount rate

Figure 16-7 clearly illustrates the inverse relationship between the discount rate and the NPC of the project, i.e. the larger the discount rate the lower the NPC. The flatter gradient of this line indicates that the total PSC is not as sensitive to this variable as it is to the project capital costs.

(iv) Inflation rate

The flat gradient shows that a 5 per cent change in the inflation rate has minimal effect on the overall PSC, which suggests that the PSC is not sensitive to changes in this variable.

(v) Maintenance and refurbishment costs

An increase/decrease of 5 per cent in this cost produces a corresponding increase/decrease of nearly $3 million on the total PSC, but as can be seen on the graph, the gradient of this cost is flatter than for the other variables tested, except for inflation. This suggests that the PSC is less sensitive to maintenance and refurbishment costs relative to the other costs tested, except for inflation.

In summary, the project PSC is more sensitive to movements in the project's capital cost, compared with other variables. These results should be reviewed with some caution because each variable is analysed separately. However, in reality these costs are often dependent on each other.

16.4 Reality check

Guidance notes - Reality check

The type of reality check or review of cost estimates conducted depends largely on the complexity of the project. The extent of the review process can range from a comprehensive audit of the calculations in the model to independent advice on the raw cost estimates.

It is considered an important exercise to ensure that the estimated costs are consistent with the scope of the project, as it is usual for the scope to change during the development of the PSC. As stated in the terms of reference for the raw cost estimates (see Section 14), a constant check to the reference project and communication between the client, technical advisers and financial advisers regarding changes to the scope of project services will help to ensure that the assumptions underlying the PSC are robust.

A review of the risk adjustments could be done by comparing the percentage likelihood of the risk occurring and associated cost impact, to empirical evidence from previous projects. A report commissioned by HM Treasury, *Review of Large Public Procurement in the UK*, July 2002,[20] investigates the 'optimism bias' in the cost estimates provided for public projects and the results and recommendations in this report may be a good starting point in reviewing project costs and risks.

A useful question to ask is whether the final estimate of the PSC is one which would be used if this were a whole-of-life risk-adjusted budget estimate to complete the project, rather than completion by a private sector consortium under PPP delivery.

It should be noted that the PSC can be refined and finalised during the procurement of the project, up to and including evaluation of the submissions received in response to the RFP. In general, refinement during the remainder of the procurement should only occur if the scope of the project changes, or it becomes apparent that a significant component has been mispriced or omitted.

It may sometimes be useful to compare the final PSC to the preliminary PSC compiled at the business case stage to assess any major changes to the costs. However, it should be noted that it is not unusual for the scope of the project to change significantly after the business case has been written and therefore this may decrease the effectiveness of this comparison.

This section of the report has been left blank on purpose as this is a worked example only and an example reality check has not been included.

[20] The report was undertaken by Mott MacDonald

17 Managing risk

Guidance notes - Managing risk

The purpose of risk analysis in developing the PSC is to evaluate project risks in terms of their effects on the outcome. The outcome can be financial or non-financial, e.g. being able to avoid, or not, a severe water shortage, or the loss of life. In all cases, however, the driving factor is the need to improve understanding of risk. Risk may or may not be quantifiable, but it is an important consideration. This section examines how risk analysis can be turned to practical use as a foundation for risk management.

Risk management describes the process for formulating management responses and policies to reduce and control the identified risks. Risk management will not remove all risk from a project, but is aimed at ensuring that risks are efficiently managed and consequently ensuring that the impact of risk is minimised.

The benefits of risk management are, for example:

- to facilitate informed and systematic decision making;
- to minimise the consequences of risk; and
- to give an improved understanding of the project through identifying the risks and thinking through response scenarios.

Project risk management is a continual process of risk review, analysis and management planning. It is intended that the PSC forms an integral part of this process at every stage of the PPP process.

The key objective of risk management through the PPP project lifecycle is the achievement of project objectives, including value for money outcomes.

The risk valuation and management process can be usefully compared to the typical management decision-making process which takes place on a regular basis within any organisation. To resolve any problem it is first necessary to recognise the problem, understand it, evaluate options for addressing the problem and finally implement the chosen solution.

Risk analysis simply involves a recognition of a formal process of identification of all material risk issues, establishing (where possible) the likely impact on the project, establishing a course of action to deal with the risks, implementing the proposed responses and monitoring their success.

With this in mind, it is important to note that risks do not disappear when transferred to a private party through a contractual mechanism. From government's perspective, the PPP approach provides a means for government to mitigate the financial effects of risks to which it would otherwise be exposed. However, risks are only mitigated to the extent of the:

- private party's ability to control risks (management quality)
- private party's ability to accept risks (credit quality)
- jurisdiction's ability to rely on the private party (contract quality).

From a risk management perspective it is also important to remember that overall project

Guidance notes - Managing risk

risk generally remains unchanged during the procurement process, unless:

- risks are removed;
- risks are reduced; and/or
- risks are created.

In this respect, one of the outcomes of the project risk quantification process is the formulation of the risk register which records all of the data from the risk workshop including some outline of risk management strategies identified.

A risk may turn out to be difficult to assess for one of two reasons. First, there may be very little knowledge about a particular variable simply because the data has not been collected in a useable form. For example, the most appropriate expert may not have been consulted or the relevant empirical data may not have been collected. Second, there may be too many genuine uncertainties in the system, and therefore the environment is too complex to make any long term predictions, e.g. fluctuations in the weather or the inflation rate in 20 years time. An analysis of risk can add value by highlighting risks that can be more accurately assessed by conducting further research.

In this case, we have simply used the uncertainty and risk analysis to direct effort into increasing our knowledge of the risks, rather than mitigating them. So how can risks be reduced?

In essence, the only way to mitigate, or control risk is by taking positive management action. A fundamental feature of the PSC is the risk identification and valuation process. The final stage of identifying risk management strategies should also form part of the process. A risk analysis model, for example, can be used to:

(a) direct the hedging of risks, for example by informing a structured approach to interest rate management, during both the procurement and contract management stages of a project

(b) evaluate whether it is in the financial interest for government to transfer an insurable risk to the private sector. Here the cost of taking out insurance can be determined, and the two scenarios of either transferring it out or not doing so can be compared in terms of their likely value.

An important feature of example (a) is that it recognises that risks (or at least their financial consequences) are only transferred to the private sector once a contract has been negotiated and signed. It is important to recognise that during the procurement phase of a project no risks have been transferred to the private party and therefore all risks reside with government. Although the PSC tends to deal with project risks that will be retained and/or transferred under a PPP approach, it is very important that the risk identification and risk management planning also takes account of risks that may crystallise during procurement.

Typically the types of risk that fall into this category include:

- interest rate movement prior to financial close;
- planning approval;
- land issues and acquisition; and
- environmental issues.

It is recommended that risk management strategies for dealing with these and other

Guidance notes - Managing risk

procurement risks start to be addressed at an early stage in the process. Taking each of the risk types above in turn, risk management strategies could include government:

- purchasing an interest rate hedge. (Any strategy for handling interest rate movements or the purchasing of any other financial products to mitigate against risk should be discussed with the relevant Treasury and/or Finance departments.);
- obtaining a planning approval or alternatively seeking to share this risk with the private sector through a Project Development Agreement (see *Risk Allocation and Standard Commercial Principles*);
- identifying and purchasing the site prior to tender; and
- coordinating Commonwealth and jurisdiction approvals and, under certain circumstances, assuming the risk of delay in obtaining the requisite approvals.

It is also important to recognise that government is an active party to a PPP contract and actions taken or not taken, as the case may be, can result in government unwittingly taking back risk or even creating risks it did not think existed. It is, therefore, essential that contract management planning starts during the procurement process. This must also include the identification and management of risks.

For further guidance on risk and contract management, refer to the complete set of *National PPP Guidelines* material, in particular *Risk Allocation and Standard Commercial Principles* guidance. As the hospital project in this worked example is only an example project, the detailed risk management planning that is necessary (and outlined in the guidance notes on risk management above) has not been carried out and documented in the PSC guidance material.

This section of the PSC report should include a discussion of risk management planning and strategies for handling risks at each stage in the project lifecycle including:

- during the bidding process;
- in final negotiations with a preferred bidder;
- between contract execution and financial close; and
- during contract management.

It is important to see this section of the PSC report as a foundation for risk management. Specific risk mitigation strategies should be identified and recorded. Risk management planning for handling the key risks to which government is exposed should be recorded in this section of the report.

Risk management report (example)

The risk register is a risk management tool that captures all the risks identified and discussed during the risk workshop, but also additional risks identified by the risk experts during further analysis. It is important to note that the risk register should be a management tool used and maintained throughout the project lifecycle. Regular status checks should be made to update and refine the data and information recorded in it.

The more important of these risks are discussed in more detail in the background to the financial model - Simple risk valuation method, Appendix C.

18 Review

Guidance notes – PSC report review section

The PSC report may be written in-house with assistance from advisers. Alternatively, the PSC report may be coordinated and written up by external advisers to the project team. Under either scenario, it is common practice for the PSC report to fully document the sources of information and the extent to which the lead external adviser has reviewed this information. A statement along the lines set out below would be an acceptable limitation on the scope of work undertaken by an external adviser.

Review report section (example)

This report is a confidential document that has been prepared by [insert name of financial adviser and/or government department] at the request of the Department of Health. It is for the sole use of the Department of Health and the Relevant PPP Authority in considering the Public Sector Comparator (PSC) for the hospital project (the project) in accordance with the procedures and requirements of government's policy and guidelines.

The information, statements and opinions (together information) contained in this report have been prepared by [insert name of financial adviser and/or government department] from material provided by third parties including:

- [insert name of technical advisers]
- [insert name of other parties as appropriate]
- the hospital project team
- the *National PPP Guidelines*

The information contained in this report is strictly confidential and must not be copied, reproduced or used, in whole or in part, for any purpose other than that for which it is intended.

Appendices

Appendix A: Glossary

Appendix B: PSC construction checklist

Appendix C: Public Sector Comparator Financial Model – Simple risk evaluation method

Appendix D: Public Sector Comparator Financial Model – Advanced risk evaluation method

Appendix A: Glossary

The following are explanations of terms used in the *Public Sector Comparator Guidance*.[21]

Term	Meaning
BAFO	Best and final offer; as part of the RFP phase, this is a further short listing process to determine a Preferred Bidder.
BOOT	Build, own, operate and transfer
Business Case	The document that articulates the rationale for undertaking a project
Competitive Neutrality	The competitive advantages that accrue to a government business by virtue of its public sector ownership
Conflict of Interest (COI)	Arises where a member of a Project Team, or an advisor to a Project Team has an affiliation or interest which might be seen to prejudice their impartiality
Consortium	Those private party persons who together intend to deliver a PPP
Consortium Members	Those persons who, together with other persons, makes up a Consortium.
Contract Summary	The document that is released to the public following financial close that sets out the key aspects of the project, including contract terms
Core Services	For social infrastructure, this refers to those services for which governments have particular responsibilities to people using the service and the community (e.g. hospitals, schools, etc.) For economic infrastructure, services included in this definition will be determined on a case by case basis
D&C	Design and construct
DBFM	Design, build, finance and maintain
DBFO	Design, build, finance, operate
DBOM	Design, build, operate, and maintain
DCM	Design, construct and maintain
Discount Rate	The rate used to calculate the present value of future cash flows See the Discount Rate Guidance for Public Private Partnerships
EOI	Means expressions of interest for a project

[21] These explanations are not necessarily the same as definitions adopted in authoritative documents, such as accounting standards. However, at the time of publication, they are not inconsistent with such definitions.

Term	Meaning
EOI Phase	The phase used to shortlist parties to proceed to the RFP Phase who are capable of delivering the project
EOI Respondents	The parties submitting a response to an Invitation for EOI issued by government for a project
EOI Responses	The responses from the market to the Invitation for EOI issued by government for a project
ESD	Ecologically sustainable development
Guidelines	These National PPP Guidelines
Intellectual Property (IP)	Inventions, original designs, and practical applications of good ideas protected by statute law through copyright, patents, registered designs, circuit layout rights and trademarks; also trade secrets, proprietary know-how and other confidential information protected against unlawful disclosure by common law and through additional contractual obligations, such as confidentiality agreements
Interactive Tender Process	The process of interaction between Shortlisted Bidders and key stakeholders during the RFP Phase as outlined in the *Practitioners' Guide*
Invitation for EOI	An invitation to the market to seek Expressions of Interest for a project
Jurisdictional Requirements Document	The set of specific guidance applicable to individual jurisdictions that are to read in conjunction with the Guidelines
National Commercial Principles for Social Infrastructure	Those principles of the Guidelines that set out the considered position of government across jurisdictions in relation to risk allocations under a PPP. This is set out in *Risk Allocation and Standard Commercial Principles*
National PPP Guidelines	The suite of guidance material that will form the national guidance on PPPs
National PPP Policy Framework	The document that will detail the scope and application of the National PPP Guidelines across governments in all jurisdictions
Negotiation and Completion Phase	The phase involving negotiations with the Preferred Bidder and finalisation and completion of contractual agreements
NPC	Net present cost
Output Specification	The document that defines the outputs and performance levels in relation to construction and services for the project, and incorporates those aspects as identified in the *Practitioners' Guide*
PPP	A public private partnership
Preferred Bidder	A Shortlisted Bidder who has been selected following the RFP 'Evaluation' Phase as preferred and to proceed to the Negotiation and Competition Phase

Term	Meaning
Probity Practitioner	An independent expert retained to monitor the bidding process at critical stages, assessing and reporting whether the process has been conducted to the required standards of probity.
Procurement Options Analysis or Strategy	The document that outlines the rationale for adopting various procurement methods for a particular project
Procuring Agency	The government body (department, agency, statutory body or GBE) that is responsible for delivering the project on behalf of government
Project Director	The person with overall responsibility for delivery of the project and management of all members of the Project Team
Project Steering Committee	The committee of departmental/agency representatives established by the Procuring Agency to direct the development of the PPP project and deal with key issues
Project Team	The group of specialists and departmental/agency representatives, established by the Procuring Agency, that is responsible for assisting the Project Director to deliver the project (including developing project documentation and undertaking evaluation processes)
PSC	The Public Sector Comparator for a project, which is defined in the Guidelines as the hypothetical, risk adjusted whole-of-life cost of a public sector project if delivered by government
Raw PSC	The base cost to government of producing and delivering the Reference Project
Reference Project	The basis for calculating the PSC, reflecting government delivery of the project by traditional means
Relevant PPP Authority	The government department or agency responsible for the application of PPP Policy within a jurisdiction (often treasuries)
Retained Risk	The value of those risks or parts of a risk that government bears under a PPP project
RFP	A request for proposal issued by government for a project
RFP 'Bid' Phase	The part of the RFP phase where Shortlisted Bidders are preparing RFP Responses
RFP 'Development' Phase	The part of the RFP phase where government is preparing RFP documentation for release to Shortlisted Bidders
RFP 'Evaluation' Phase	The part of the RFP phase where government is evaluating RFP Responses
RFP Phase	The phase involving the release of the RFP to Shortlisted Bidders for detailed, fully costed and binding RFP Responses, followed by evaluation and selection of the Preferred Bidder
RFP Response	A Proposal from a Shortlisted Bidder in response to the RFP issued by government for a project

Term	Meaning
Risk Allocation	The allocation of responsibility for dealing with the consequences of each risk to one of the parties to the contract; or alternatively, agreeing to deal with a particular risk through a specified mechanism which may involve sharing that risk
Shortlisted Bidder	Those parties who are invited to submit a Proposal in response to an RFP issued by government for a project
Special Purpose Vehicle (SPV)	In establishing a project consortium, the sponsor or sponsors typically establish the private party in the form of a special purpose vehicle (SPV) which contracts with government. The SPV is an entity created to act as the legal manifestation of a project consortium
Tender Process	Includes each of the following phases: • EOI Phase; • RFP Phase; and • Negotiation and Completion Phase
Traditional Procurement	The delivery of the infrastructure and associated services by government using its normal procurement processes
Transferred Risk	The value of those risks (from government's perspective) that are likely to be allocated to the private party under a PPP project.
Whole-of-life	The integration of up-front design and construction with ongoing maintenance and refurbishment elements over the life of the asset under the PPP arrangement

Appendix B: PSC construction checklist

The following checklist may be helpful in verifying that a Public Sector Comparator (PSC) has been rigorously constructed according to the guidance provided in this technical note.

Defining the scope of the Reference Project

- ❑ Does the Reference Project satisfy the requirements under the output specification?
- ❑ Is the Reference Project based on the most efficient and appropriate form of public sector delivery?
- ❑ Does the PSC reflect the public sector delivery proposed in the Reference Project?

Quantifying the various elements of the PSC

- ❑ Verify that all costs have been included in the four elements of the PSC (Raw PSC, Competitive Neutrality, Transferred Risk and Retained Risk).
- ❑ Ensure that all capital costs (upfront and ongoing), and operating and maintenance costs to deliver the service are included.
- ❑ Ensure that all material and quantifiable risks have been identified and accurately valued using appropriate valuation techniques.
- ❑ Run a sensitivity analysis to determine the flexibility and robustness of the PSC model if changes are made in the key assumptions and the underlying Reference Project.
- ❑ Has a sanity check been performed on the various components of the model to verify that the assumptions are reasonable, including capital, operating and maintenance costs?

Ensuring an adequate audit trail is maintained

- ❑ Record and discuss the key assumptions used in the PSC. Are these assumptions realistic and appropriate taking into account observation of past practice, performance, current practice and anticipated future developments?
- ❑ Record valuation methodologies employed for various costs, including the techniques used to value key risks.
- ❑ Construct a detailed risk matrix analysis including the expected consequence of risk, financial impact and proposed mitigation strategy.
- ❑ An independent party should check the reasonableness of the assumptions and confirm that the assumptions made have been incorporated correctly into the model to produce an accurate result (both arithmetic and logic).

Compliance with all applicable procedures and approvals

- ❑ Ensure procurement team has appropriate resources to devote to the construction of a PSC.
- ❑ Determine the disclosure policy for the PSC, having regard to the expected level of competition in the market and other relevant factors.
- ❑ Ensure the portfolio Minister and the relevant Cabinet committee (where appropriate) have formally signed off on the final PSC before the commencement of the bidding process.
- ❑ Ensure the portfolio Minister has formally confirmed to the Treasurer that the PSC has been met or improved upon by an acceptable bid.

Appendix C: Public Sector Comparator Financial Model – Simple risk evaluation method

PSC Worked Example Hospital Project

Public Sector Comparator Financial Model - Simple Risk Evaluation Method

Prepared by	[Insert name]
Spreadsheet Title	PSC Worked Example Hospital Project
Status	Final
File Reference	[Insert file name]

Contents

Software Specifications Microsoft Excel 2000

Operating Instructions

1 Inputs are shaded in light blue
2 Assumptions, with the exception of some timing assumptions, are entered on the "Assumptions" worksheet
3 Expenditure and risk timing assumptions are entered on the "Timing Assumptions" worksheet
4 Key results are recorded on the "Outputs" worksheet

Notes to the Model

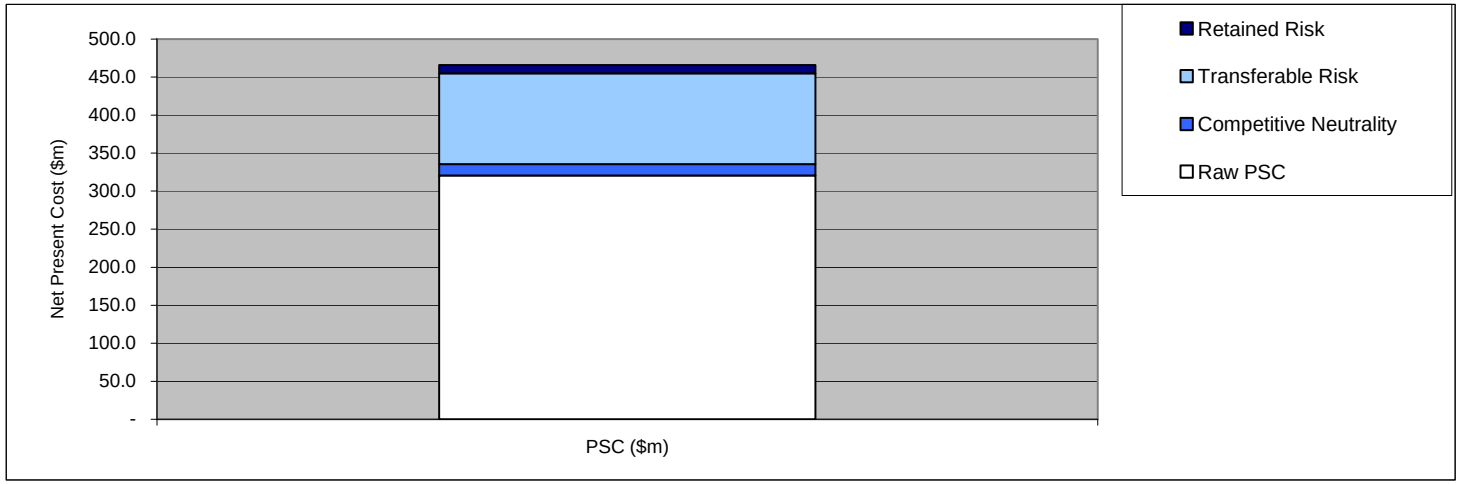
All units are in $'000s unless otherwise stated
Currency in Australian dollars

PSC Worked Example Hospital Project

Outputs

Risk Adjusted Public Sector Comparator

	PSC ($m)	%
Raw PSC	320.6	69%
Competitive Neutrality	15.0	3%
Transferable Risk	119.4	26%
Retained Risk	11.1	2%
	466	100%



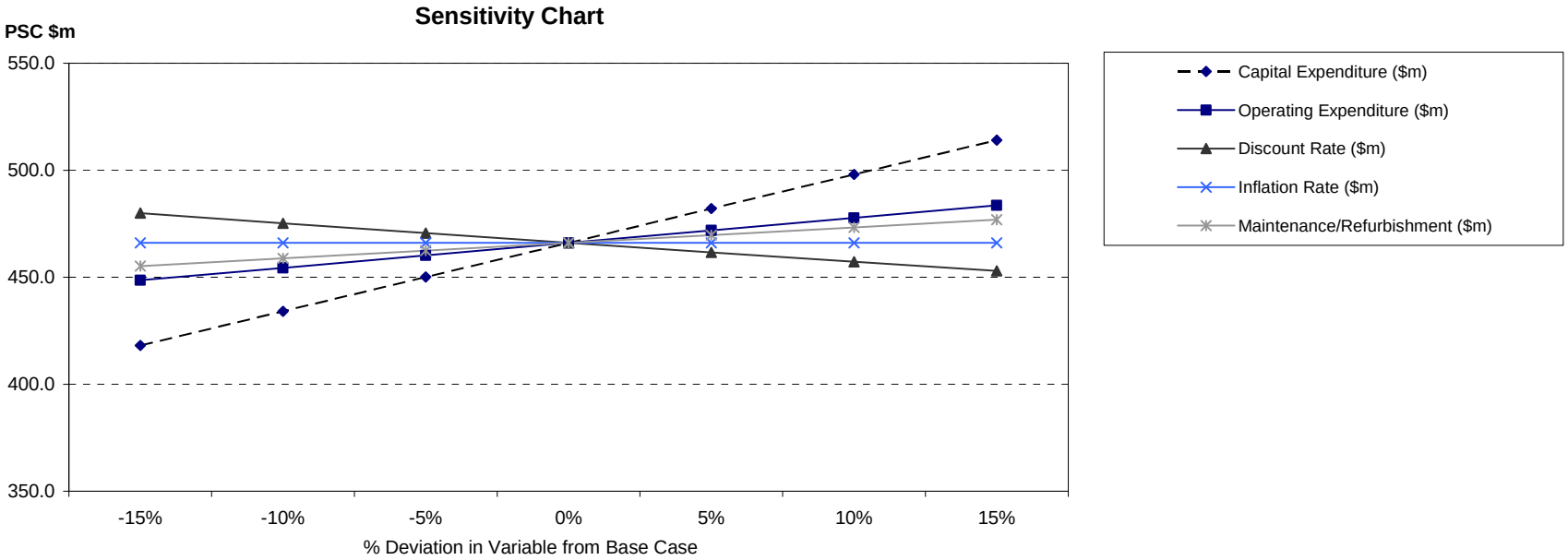
Outputs

Sensitivity Analysis

	Movement in assumption	PSC ($m)
Capital Expenditure	-15%	(418.1)
	-10%	(434.1)
	-5%	(450.1)
	0	(466.1)
	5%	(482.0)
	10%	(498.0)
	15%	(514.0)
Operating Expenditure	-15%	(448.6)
	-10%	(454.4)
	-5%	(460.2)
	0	(466.1)
	5%	(471.9)
	10%	(477.7)
	15%	(483.5)
Discount Rate	-15%	(479.9)
	-10%	(475.2)
	-5%	(470.6)
	0	(466.1)
	5%	(461.6)
	10%	(457.2)
	15%	(453.0)
Inflation Rate	-15%	(466.1)
	-10%	(466.1)
	-5%	(466.1)
	0	(466.1)
	5%	(466.0)
	10%	(466.0)
	15%	(466.0)
Maintenance/Refurbishment	-15%	(455.2)
	-10%	(458.8)
	-5%	(462.4)
	0	(466.1)
	5%	(469.7)
	10%	(473.3)
	15%	(476.9)

Sensitivity Analysis - Results

		% Deviation in Variable from Base Case						
		-15%	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**
Capital Expenditure	($m)	418.1	434.1	450.1	466.1	482.0	498.0	514.0
Operating Expenditure	($m)	448.6	454.4	460.2	466.1	471.9	477.7	483.5
Discount Rate	($m)	479.9	475.2	470.6	466.1	461.6	457.2	453.0
Inflation Rate	($m)	466.1	466.1	466.1	466.1	466.0	466.0	466.0
Maintenance/Refurbishment	($m)	455.2	458.8	462.4	466.1	469.7	473.3	476.9



PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Assumptions

General	Base Assumption	Assumption Used		Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Key Variables									
CPI Rate	2.5%	2.5%		Source:[DTF]	DTF	14-Mar-02	Report	Yes	
Discount Rate (real)	5.0%	5.0%		Source:[DTF]	DTF	6-Feb-02	Report	Yes	
Discount Rate (nominal)	7.62%	7.62%							
Cashflows discounted back to	1-Jul-02	1-Jul-02			Project Director	11-Nov-01	Report	No	Seek confirmation
General									
No. of months per period	12.00	12.00							

Capital Costs	Base Assumption	Assumption Used	CPI +/-	Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Timing									
Start Date	30-May-02	30-May-02			Project Brief	11-Nov-01	Report	No	Seek confirmation
Direct Costs									
Project Design	500	500	0.00%		Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
Land acquisition and development	5,000	5,000	0.00%	Based on market value	Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
D&C contract price	150,000	150,000	0.00%		Technical (Capital Cost) Advisor	18-Jan-02	Email	Yes	
Payments to Consultants	1,000	1,000	0.00%	Assume [ ]% of construction cost	Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
Acquisition of plant and equipment	50,000	50,000	0.00%	Assumes AUD/USD exchange rate of 0.57	Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
Capital improvements to existing facilities	15,000	15,000	0.00%	Assumes 10% of D&C contract price	Technical (Capital Cost) Advisor	18-Jan-02	Email	Yes	
Required through-life capital expenditure	40,000	40,000	0.00%	Applied equally in years 5, 8 and 11 (3 year capital cycle)	Technical (Capital Cost) Advisor	18-Jan-02	Email	Yes	
Indirect Costs									
Construction overheads (annual)	1,000	1,000	0.00%		Technical (Capital Cost) Advisor	18-Jan-02	Report	Yes	

Operating and Maintenance Costs	Base Assumption	Assumption Used	CPI +/-	Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Timing									
Start Date	1-Jul-04	1-Jul-04			DTF	11-Nov-01	Report	No	Seek confirmation
Duration Years	10	10			DTF	11-Nov-01	Report	No	Seek confirmation
End Date	30-Jun-14	30-Jun-14							
Maintenance costs									
Maintenance and repairs	4,000	4,000	1.00%		Technical (Capital Cost) Advisor	1-Feb-02	Fax	Yes	
Direct operating costs									
Cost of materials	1,500	1,500	0.00%	Assumes [ ] % of capital cost	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Wages and salaries	5,000	5,000	1.00%	Assumes 100 EFT @ $50,000 p.a.	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Other employee costs	1,000	1,000	1.00%	Assumes [ ]% of wages and salaries	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Electricity, etc	2,000	2,000	0.00%	Assumes $[ ] per unit of electricity, $[ ] per unit of gas etc	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Direct management costs	1,000	1,000	0.00%		Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Insurance	1,250	1,250	0.00%		DTF	28-Feb-02	Email	Yes	
Indirect operating costs									
Operating overheads (annual)	200	200	0.00%	Based on [ ] sqm	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Administrative overheads	500	500	1.00%	Based on [ ] of staff	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Indirect capital cost allocation	100	100	0.00%	Based on historical data and projected costs	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Third-party revenue									
Third-party revenue expected	5,000	5,000	0.00%	Includes car parking and retail revenue	Technical (Operating cost) Advisor	1-Feb-02	Fax	No	

Assumptions

Competitive Neutrality	Base Assumption	Assumption Used	Unit	Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Land Tax									
Base	0.06	0.06	$'000	$60 on land value to $200,000	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Threshold	200	200	$'000		Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Excess	0.002	0.002	$	0.2 cents for each dollar in excess of $200,000	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Local government rates	0.009	0.009	$	0.8725 cents per dollar of the value of the property	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Stamp duty	5.68%	5.68%	%p.a	Based on the stamp duty rates payable on the value of the land	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Payroll tax	7.00%	7.00%	%p.a	7% of wages and salaries per year	Technical (Operating cost) Advisor	5-Dec-01	Email	Yes	

Sensitivity Analysis	Base Assumption	Assumption Used		Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Capital Expenditure	0.00%	0.00%							
Operating Expenditure	0.00%	0.00%							
Discount rate	0.00%	0.00%							
Inflation rate	0.00%	0.00%							
Maintenance/Refurbishment	0.00%	0.00%							

PSC Worked Example Hospital Project

Timing Assumptions

Year number	0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending	30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Timing of Expenditure													
Direct Costs													
Project Design	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Land acquisition and development	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
D&C contract price	15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Payments to Consultants	33.33%	33.33%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acquisition of plant and equipment	10.00%	30.00%	60.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Capital improvements to existing facilities	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Required through-life capital expenditure	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%
Indirect Costs													
Construction overheads (annual)	100.00%	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Risk Timing Flags													
Code	**Description**												
T1	Construction Period	15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T2	Construction Period - Overrun	0.00%	15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T3	Regulatory Risk Period	0.00%	16.70%	33.30%	66.70%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
T4	Upgrade Risk Period	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T5	Service Maintenance Period	0.00%	15.00%	30.00%	40.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T6	Operating Period	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
T7	Technology Risk Period	0.00%	0.00%	0.00%	20.00%	30.00%	50.00%	20.00%	30.00%	50.00%	20.00%	30.00%	50.00%	20.00%

PSC Worked Example Hospital Project

Risk Assumptions - Simple Probability Technique

Risk	Description	Timing	Description
D	Design risks	T1	Construction Period
L	Change in Law risks	T2	Construction Period - Overrun
O	Operating risks	T3	Regulatory Risk Period
		T4	Upgrade Risk Period
		T5	Service Maintenance Period
		T6	Operating Period
		T7	Technology Risk Period

Allocation	Code	Risk	Timing	Description	Consequence	Risk Expert	Applied to	Base	Scenario	Consequence	Probability	Value
Retained	O5	Maintenance Risk: Patient Area	T6	Risk that maintenance costs differ from expectations	Increase in costs	*[Risk Expert/Source of Risk Estimates for each risk]*	20% of the cost of maintenance and materials	(1,000)				
									Below base amount	-5%	5%	3
									No deviation from base	0%	15%	0
									Overrun: likely	45%	45%	(223)
									Overrun: moderate	75%	25%	(206)
									Overrun: extreme	120%	10%	(132)
									Subtotal		100%	(558)
	L1	Regulatory Risk	T3	Risk that a change in law has an adverse effect on the Project	Increase in cost		-	(1,000)				
									Change in Law Risk	100%	100%	(1,000)
Transferable	D1	Cost overrun	T1	Risk that construction costs are greater than estimated.	Delay in works commencement or completion and cost increases.		D&C Cost	(150,000)				
									Below base amount	-5%	5%	375
									No deviation from base	0%	10%	0
									Overrun: likely	15%	50%	(11,250)
									Overrun: moderate	30%	20%	(9,000)
									Overrun: extreme	40%	15%	(9,000)
									Subtotal		100%	(28,875)

Risk Assumptions - Simple Probability Technique

Allocation	Code	Risk	Timing	Description	Consequence	Risk Expert	Applied to	Base	Scenario	Consequence	Probability	Value
Transferable	D2	Time Overrun	T2	Risk that the construction timelines are not met.	Additional construction time and cost.		D&C Cost	(150,000)				
									Below base amount	0%	5%	0
									No deviation from base	0%	20%	0
									Overrun: likely	10%	40%	(6,000)
									Overrun: moderate	15%	30%	(6,750)
									Overrun: extreme	20%	5%	(1,500)
									Subtotal		100%	(14,250)
	D3	Service Maintenance	T5	Risk of increase in service maintenance during delay period	Additional construction time and cost.			(5,000)				
									Below base amount	0%	5%	0
									No deviation from base	0%	20%	0
									Overrun: likely	100%	40%	(2,000)
									Overrun: moderate	200%	30%	(3,000)
									Overrun: extreme	200%	5%	(500)
									Subtotal		100%	(5,500)
	D4	Upgrade Cost	T4	Risk that refurbishment requirements are greater than anticipated	Increase in costs		Through-life capex	(40,000)				
									Below base amount	-5%	5%	100
									No deviation from base	0%	10%	0
									Overrun: likely	15%	50%	(3,000)
									Overrun: moderate	30%	20%	(2,400)
									Overrun: extreme	40%	15%	(2,400)
									Subtotal		100%	(7,700)
	D5	Construction Contingency Factor	T1	Risk that cost of construction increases due to unforseen circumstances	Increase in costs		D&C and land acquisition	(155,000)				
									Contingency factor	2%	100%	(3,100)

Allocation	Code	Risk	Timing	Description	Consequence	Risk Expert	Applied to	Base	Scenario	Consequence	Probability	Value
Transferable	O1	Operating Risk	T6	Risk that operating costs are underestimated	Increase in costs		Operating Costs	(12,550)				
									Below base amount	-5%	5%	31
									No deviation from base	0%	25%	0
									Overrun: likely	15%	40%	(753)
									Overrun: moderate	29%	25%	(924)
									Overrun: extreme	40%	5%	(251)
									Subtotal		100%	(1,897)
	O2	Contingency factor (Operating Costs)	T6		Increase in costs		Operating Costs	(13,550)				
									Contingency factor	3%	100%	(407)
	O3	Third party revenue risk	T6	Risk that third party revenue differs from expectations	Increase in costs		Third-party revenue	(5,000)				
									Above base amount	-10%	15%	75
									No deviation from base	0%	50%	0
									Below base: likely	10%	30%	(150)
									Below base: moderate	20%	5%	(50)
									Subtotal		100%	(125)
	O4	Maintenance Risk: General	T6	Risk that maintenance costs differ from expectations	Increase in costs		80% of the cost of maintenance and materials	(4,400)				
									Below base amount	-5%	5%	11
									No deviation from base	0%	15%	0
									Overrun: likely	15%	45%	(297)
									Overrun: moderate	28%	25%	(308)
									Overrun: extreme	50%	10%	(220)
									Subtotal		100%	(814)
	O6	Contingency factor (Maintenance & Materials)	T6	Risk that operating costs are underestimated	Increase in costs		Cost of maintenance and materials	(5,500)				
									Contingency factor	3%	100%	(165)

Risk Assumptions - Simple Probability Technique

Allocation	Code	Risk	Timing	Description	Consequence	Risk Expert	Applied to	Base	Scenario	Consequence	Probability	Value
Transferable	O7	Performance Risk	T6	Risk that KPIs are not met and State to incur costs to remedy	Delay and cost increases		-	(5,000)				
									No deviation from base	0%	70%	0
									Overrun: likely	100%	30%	(1,500)
									Subtotal		100%	(1,500)
	O8	Industrial Relations Risk	T6	Risk of Industrial Relations disruptions	Increase in cost		-	(1,000)				
									Industrial Relations Risk	100%	100%	(1,000)
	O9	Technology Risk	T7	Risk of technical obsolescence	Adverse cost consequences in order to comply with the change.		Plant and equipment cost	(50,000)				
									Below base amount	-20%	20%	2,000
									No deviation from base	0%	10%	0
									Overrun: likely	30%	40%	(6,000)
									Overrun: moderate	40%	20%	(4,000)
									Overrun: extreme	50%	10%	(2,500)
									Subtotal		100%	(10,500)

PSC Worked Example Hospital Project

All units are in $'000s unless otherwise stated

Risk-adjusted PSC

Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending	**NPC**	**Nominal**	30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Discount Factors			1.000	0.929	0.864	0.802	0.745	0.693	0.644	0.598	0.555	0.516	0.480	0.445	0.414
Raw PSC															
Capital Costs															
Direct Costs															
Project Design	(500)	(500)	(500)	-	-	-	-	-	-	-	-	-	-	-	-
Land acquisition and development	(5,001)	(5,000)	(5,000)	-	-	-	-	-	-	-	-	-	-	-	-
D&C contract price	(139,589)	(155,700)	(22,500)	(53,813)	(55,158)	(24,230)	-	-	-	-	-	-	-	-	-
Payments to Consultants	(953)	(1,025)	(333)	(342)	(350)	-	-	-	-	-	-	-	-	-	-
Acquisition of plant and equipment	(46,511)	(51,894)	(5,000)	(15,375)	(31,519)	-	-	-	-	-	-	-	-	-	-
Capital improvements to existing facilities	(11,753)	(16,971)	-	-	-	-	-	(16,971)	-	-	-	-	-	-	-
Required through-life capital expenditure	(27,262)	(48,825)	-	-	-	-	-	(15,085)	-	-	(16,245)	-	-	(17,494)	-
Indirect Costs															
Construction overheads (annual)	(2,860)	(3,076)	(1,000)	(1,025)	(1,051)	-	-	-	-	-	-	-	-	-	-
Subtotal: Capital Costs	(234,430)	(282,991)	(34,333)	(70,554)	(88,077)	(24,230)	-	(32,057)	-	-	(16,245)	-	-	(17,494)	-
Operating and Maintenance Costs															
Maintenance costs															
Maintenance and repairs	(30,030)	(52,027)	-	-	-	(4,435)	(4,590)	(4,751)	(4,917)	(5,089)	(5,267)	(5,452)	(5,642)	(5,840)	(6,044)
Direct operating costs															
Cost of materials	(10,507)	(18,097)	-	-	-	(1,615)	(1,656)	(1,697)	(1,740)	(1,783)	(1,828)	(1,873)	(1,920)	(1,968)	(2,017)
Wages and salaries	(37,537)	(65,034)	-	-	-	(5,544)	(5,738)	(5,938)	(6,146)	(6,361)	(6,584)	(6,814)	(7,053)	(7,300)	(7,555)
Other employee costs	(7,507)	(13,007)	-	-	-	(1,109)	(1,148)	(1,188)	(1,229)	(1,272)	(1,317)	(1,363)	(1,411)	(1,460)	(1,511)
Electricity, etc	(14,009)	(24,130)	-	-	-	(2,154)	(2,208)	(2,263)	(2,319)	(2,377)	(2,437)	(2,498)	(2,560)	(2,624)	(2,690)
Direct management costs	(7,005)	(12,065)	-	-	-	(1,077)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
Insurance	(8,756)	(15,081)	-	-	-	(1,346)	(1,380)	(1,414)	(1,450)	(1,486)	(1,523)	(1,561)	(1,600)	(1,640)	(1,681)
Indirect operating costs															
Operating overheads (annual)	(1,401)	(2,413)	-	-	-	(215)	(221)	(226)	(232)	(238)	(244)	(250)	(256)	(262)	(269)
Administrative overheads	(3,754)	(6,503)	-	-	-	(554)	(574)	(594)	(615)	(636)	(658)	(681)	(705)	(730)	(756)
Indirect capital cost allocation	(700)	(1,206)	-	-	-	(108)	(110)	(113)	(116)	(119)	(122)	(125)	(128)	(131)	(134)
Third-party revenue															
Third-party revenue expected	35,024	60,324	-	-	-	5,384	5,519	5,657	5,798	5,943	6,092	6,244	6,400	6,560	6,724
Subtotal: Operating Costs	(86,183)	(149,240)	-	-	-	(12,772)	(13,208)	(13,659)	(14,125)	(14,607)	(15,106)	(15,622)	(16,155)	(16,707)	(17,278)
Subtotal: Raw PSC	(320,613)	(432,231)	(34,333)	(70,554)	(88,077)	(37,002)	(13,208)	(45,715)	(14,125)	(14,607)	(31,351)	(15,622)	(16,155)	(34,202)	(17,278)

Risk-adjusted PSC

Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending	**NPC**	**Nominal**	30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Competitive Neutrality															
Land Tax	(85)	(135)	-	(10)	(10)	(10)	(11)	(11)	(11)	(11)	(12)	(12)	(12)	(13)	(13)
Local government rates	(11,988)	(19,123)	-	(1,386)	(1,421)	(1,456)	(1,493)	(1,530)	(1,568)	(1,608)	(1,648)	(1,689)	(1,731)	(1,774)	(1,819)
Stamp duty	(284)	(284)	(284)	-	-	-	-	-	-	-	-	-	-	-	-
Payroll tax	(2,628)	(4,552)	-	-	-	(388)	(402)	(416)	(430)	(445)	(461)	(477)	(494)	(511)	(529)
Subtotal:	(14,985)	(24,094)	(284)	(1,396)	(1,431)	(1,855)	(1,905)	(1,957)	(2,010)	(2,064)	(2,120)	(2,178)	(2,237)	(2,298)	(2,360)
Total non-risk adjusted PSC	(335,598)	(456,325)	(34,617)	(71,950)	(89,508)	(38,857)	(15,113)	(47,672)	(16,135)	(16,671)	(33,471)	(17,800)	(18,392)	(36,500)	(19,639)
Transferable Risk															
Cost overrun	(26,871)	(29,972)	(4,331)	(10,359)	(10,618)	(4,664)	-	-	-	-	-	-	-	-	-
Time Overrun	(12,629)	(15,161)	-	(2,191)	(5,240)	(5,371)	(2,359)	-	-	-	-	-	-	-	-
Service Maintenance	(4,862)	(5,859)	-	(846)	(1,734)	(2,369)	(911)	-	-	-	-	-	-	-	-
Upgrade Cost	(7,335)	(7,893)	-	(7,893)	-	-	-	-	-	-	-	-	-	-	-
Construction Contingency Factor	(2,885)	(3,218)	(465)	(1,112)	(1,140)	(501)	-	-	-	-	-	-	-	-	-
Operating Risk	(13,287)	(22,886)	-	-	-	(2,043)	(2,094)	(2,146)	(2,200)	(2,255)	(2,311)	(2,369)	(2,428)	(2,489)	(2,551)
Contingency factor (Operating Costs)	(2,847)	(4,904)	-	-	-	(438)	(449)	(460)	(471)	(483)	(495)	(508)	(520)	(533)	(547)
Third party revenue risk	(876)	(1,508)	-	-	-	(135)	(138)	(141)	(145)	(149)	(152)	(156)	(160)	(164)	(168)
Maintenance Risk: General	(5,702)	(9,821)	-	-	-	(877)	(899)	(921)	(944)	(968)	(992)	(1,017)	(1,042)	(1,068)	(1,095)
Contingency factor (Maintenance & Materials)	(1,156)	(1,991)	-	-	-	(178)	(182)	(187)	(191)	(196)	(201)	(206)	(211)	(216)	(222)
Performance Risk	(10,507)	(18,097)	-	-	-	(1,615)	(1,656)	(1,697)	(1,740)	(1,783)	(1,828)	(1,873)	(1,920)	(1,968)	(2,017)
Industrial Relations Risk	(7,005)	(12,065)	-	-	-	(1,077)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
Technology Risk	(23,406)	(40,622)	-	-	-	(2,261)	(3,477)	(5,940)	(2,435)	(3,744)	(6,397)	(2,623)	(4,032)	(6,888)	(2,824)
Subtotal: Transferable Risk	(119,367)	(173,997)	(4,796)	(22,400)	(18,731)	(21,528)	(13,268)	(12,624)	(9,286)	(10,766)	(13,594)	(10,000)	(11,594)	(14,640)	(10,769)
Retained Risk															
Regulatory Risk	(7,178)	(12,227)	-	(171)	(350)	(718)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
Maintenance Risk: Patient Area	(3,910)	(6,735)	-	-	-	(601)	(616)	(632)	(647)	(664)	(680)	(697)	(715)	(732)	(751)
Subtotal: Retained Risk	(11,089)	(18,962)	-	(171)	(350)	(1,319)	(1,720)	(1,763)	(1,807)	(1,852)	(1,899)	(1,946)	(1,995)	(2,045)	(2,096)
PSC net present cost	(466,054)														

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Raw PSC

	NPC	Nominal	0	1	2	3	4	5	6	7	8	9	10	11	12
Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending			30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Cashflows															
Total Construction Costs	(234,430)	(282,991)	(34,333)	(70,554)	(88,077)	(24,230)	-	(32,057)	-	-	(16,245)	-	-	(17,494)	-
Total Operating and Maintenance Costs	(86,183)	(149,240)	-	-	-	(12,772)	(13,208)	(13,659)	(14,125)	(14,607)	(15,106)	(15,622)	(16,155)	(16,707)	(17,278)
Raw PSC	(320,613)	(432,231)													
Discount Factor															
Discount Factor			1.000	0.929	0.864	0.802	0.745	0.693	0.644	0.598	0.555	0.516	0.480	0.445	0.414
Timing of Expenditure (%)															
Direct Costs															
Project Design			100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Land acquisition and development			100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
D&C contract price			15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Payments to Consultants			33.33%	33.33%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acquisition of plant and equipment			10.00%	30.00%	60.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Capital improvements to existing facilities			0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Required through-life capital expenditure			0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%
Indirect Costs															
Construction overheads (annual)			1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Operating Period			0.00%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Inflation Factors - Capital Costs															
Direct Costs															
Project Design			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Land acquisition and development			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
D&C contract price			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Payments to Consultants			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Acquisition of plant and equipment			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Capital improvements to existing facilities			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Required through-life capital expenditure			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Indirect Costs															
Construction overheads (annual)			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Inflation Factors - Operations and Construction															
Maintenance costs															
Maintenance and repairs			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Direct operating costs															
Cost of materials			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Wages and salaries			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Other employee costs			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Electricity, etc			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Direct management costs			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Insurance			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345

Raw PSC

Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending			30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Indirect operating costs															
Operating overheads (annual)			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Administrative overheads			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Indirect capital cost allocation			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Third-party revenue															
Third-party revenue expected			1.000	1.025	1.050625	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Capital Costs															
Direct Costs															
Project Design	(500)	(500)	(500)	-	-	-	-	-	-	-	-	-	-	-	-
Land acquisition and development	(5,001)	(5,000)	(5,000)	-	-	-	-	-	-	-	-	-	-	-	-
D&C contract price	(139,589)	(155,700)	(22,500)	(53,813)	(55,158)	(24,230)	-	-	-	-	-	-	-	-	-
Payments to Consultants	(953)	(1,025)	(333)	(342)	(350)	-	-	-	-	-	-	-	-	-	-
Acquisition of plant and equipment	(46,511)	(51,894)	(5,000)	(15,375)	(31,519)	-	-	-	-	-	-	-	-	-	-
Capital improvements to existing facilities	(11,753)	(16,971)	-	-	-	-	-	(16,971)	-	-	-	-	-	-	-
Required through-life capital expenditure	(27,262)	(48,825)	-	-	-	-	-	(15,085)	-	-	(16,245)	-	-	(17,494)	-
Indirect Costs															
Construction overheads (annual)	(2,860)	(3,076)	-1000	-1025	-1050.625	-	-	-	-	-	-	-	-	-	-
Total Construction Costs	(234,430)	(282,991)	(34,333)	(70,554)	(88,077)	(24,230)	-	(32,057)	-	-	(16,245)	-	-	(17,494)	-
Operating and Maintenance Costs															
Maintenance costs															
Maintenance and repairs	(30,030)	(52,027)	-	-	-	(4,435)	(4,590)	(4,751)	(4,917)	(5,089)	(5,267)	(5,452)	(5,642)	(5,840)	(6,044)
Direct operating costs															
Cost of materials	(10,507)	(18,097)	-	-	-	(1,615)	(1,656)	(1,697)	(1,740)	(1,783)	(1,828)	(1,873)	(1,920)	(1,968)	(2,017)
Wages and salaries	(37,537)	(65,034)	-	-	-	(5,544)	(5,738)	(5,938)	(6,146)	(6,361)	(6,584)	(6,814)	(7,053)	(7,300)	(7,555)
Other employee costs	(7,507)	(13,007)	-	-	-	(1,109)	(1,148)	(1,188)	(1,229)	(1,272)	(1,317)	(1,363)	(1,411)	(1,460)	(1,511)
Electricity, etc	(14,009)	(24,130)	-	-	-	(2,154)	(2,208)	(2,263)	(2,319)	(2,377)	(2,437)	(2,498)	(2,560)	(2,624)	(2,690)
Direct management costs	(7,005)	(12,065)	-	-	-	(1,077)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
Insurance	(8,756)	(15,081)	-	-	-	(1,346)	(1,380)	(1,414)	(1,450)	(1,486)	(1,523)	(1,561)	(1,600)	(1,640)	(1,681)
Indirect operating costs															
Operating overheads (annual)	(1,401)	(2,413)	-	-	-	(215)	(221)	(226)	(232)	(238)	(244)	(250)	(256)	(262)	(269)
Administrative overheads	(3,754)	(6,503)	-	-	-	(554)	(574)	(594)	(615)	(636)	(658)	(681)	(705)	(730)	(756)
Indirect capital cost allocation	(700)	(1,206)	-	-	-	(108)	(110)	(113)	(116)	(119)	(122)	(125)	(128)	(131)	(134)
Third-party revenue															
Third-party revenue expected	35,024	60,324	-	-	-	5,384	5,519	5,657	5,798	5,943	6,092	6,244	6,400	6,560	6,724
Total Operating and Maintenance Costs	(86,183)	(149,240)	-	-	-	(12,772)	(13,208)	(13,659)	(14,125)	(14,607)	(15,106)	(15,622)	(16,155)	(16,707)	(17,278)
Raw PSC	(320,613)	(432,231)	(34,333)	(70,554)	(88,077)	(37,002)	(13,208)	(45,715)	(14,125)	(14,607)	(31,351)	(15,622)	(16,155)	(34,202)	(17,278)

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Competitive Neutrality

Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending			30-Jun-02	30-Jun-03	30-Jun-04	30-Jun-05	30-Jun-06	30-Jun-07	30-Jun-08	30-Jun-09	30-Jun-10	30-Jun-11	30-Jun-12	30-Jun-13	30-Jun-14
Cashflows	**NPC**	**Nominal**													
Competitive Neutrality	(14,985)	(24,094)	(284)	(1,396)	(1,431)	(1,855)	(1,905)	(1,957)	(2,010)	(2,064)	(2,120)	(2,178)	(2,237)	(2,298)	(2,360)
Discount Factor															
Discount Factors			1.000	0.929	0.864	0.802	0.745	0.693	0.644	0.598	0.555	0.516	0.480	0.445	0.414
Inflation Factor															
Inflation Factor			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Competitive Neutrality															
Land Tax	(85)	(135)	-	(10)	(10)	(10)	(11)	(11)	(11)	(11)	(12)	(12)	(12)	(13)	(13)
Local government rates	(11,988)	(19,123)	-	(1,386)	(1,421)	(1,456)	(1,493)	(1,530)	(1,568)	(1,608)	(1,648)	(1,689)	(1,731)	(1,774)	(1,819)
Stamp duty	(284)	(284)	(284)	-	-	-	-	-	-	-	-	-	-	-	-
Payroll tax	(2,628)	(4,552)	-	-	-	(388)	(402)	(416)	(430)	(445)	(461)	(477)	(494)	(511)	(529)
Total	(14,985)	(24,094)	(284)	(1,396)	(1,431)	(1,855)	(1,905)	(1,957)	(2,010)	(2,064)	(2,120)	(2,178)	(2,237)	(2,298)	(2,360)

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Risk - Simple

Year number					0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending					30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Summary Risks			**NPC**	**Nominal**													
Retained			(11,089)	(18,962)	0	(171)	(350)	(1,319)	(1,720)	(1,763)	(1,807)	(1,852)	(1,899)	(1,946)	(1,995)	(2,045)	(2,096)
Transferable			(119,367)	(173,997)	(4,796)	(22,400)	(18,731)	(21,528)	(13,268)	(12,624)	(9,286)	(10,766)	(13,594)	(10,000)	(11,594)	(14,640)	(10,769)
			(130,456)	(192,960)	(4,796)	(22,571)	(19,081)	(22,848)	(14,988)	(14,387)	(11,093)	(12,619)	(15,493)	(11,946)	(13,589)	(16,684)	(12,865)
Financial Indices																	
Inflation factors					1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Timing Flags																	
	T1	Construction Period			0.15	0.35	0.35	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T2	Construction Period - Overrun			0.00	0.15	0.35	0.35	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T3	Regulatory Risk Period			0.00	0.17	0.33	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	T4	Upgrade Risk Period			0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T5	Service Maintenance Period			0.00	0.15	0.30	0.40	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T6	Operating Period			0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	T7	Technology Risk Period			0.00	0.00	0.00	0.20	0.30	0.50	0.20	0.30	0.50	0.20	0.30	0.50	0.20
Risks																	
Risk ID	*Timing*	*Risks*															
Retained Risk																	
L1	T3	Regulatory Risk	(7,178)	(12,227)	0	(171)	(350)	(718)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
O5	T6	Maintenance Risk: Patient Area	(3,910)	(6,735)	0	0	0	(601)	(616)	(632)	(647)	(664)	(680)	(697)	(715)	(732)	(751)
			(11,089)	(18,962)	0	(171)	(350)	(1,319)	(1,720)	(1,763)	(1,807)	(1,852)	(1,899)	(1,946)	(1,995)	(2,045)	(2,096)
Transferable Risk																	
D1	T1	Cost overrun	(26,871)	(29,972)	(4,331)	(10,359)	(10,618)	(4,664)	0	0	0	0	0	0	0	0	0
D2	T2	Time Overrun	(12,629)	(15,161)	0	(2,191)	(5,240)	(5,371)	(2,359)	0	0	0	0	0	0	0	0
D3	T5	Service Maintenance	(4,862)	(5,859)	0	(846)	(1,734)	(2,369)	(911)	0	0	0	0	0	0	0	0
D4	T4	Upgrade Cost	(7,335)	(7,893)	0	(7,893)	0	0	0	0	0	0	0	0	0	0	0
D5	T1	Construction Contingency Factor	(2,885)	(3,218)	(465)	(1,112)	(1,140)	(501)	0	0	0	0	0	0	0	0	0
O1	T6	Operating Risk	(13,287)	(22,886)	0	0	0	(2,043)	(2,094)	(2,146)	(2,200)	(2,255)	(2,311)	(2,369)	(2,428)	(2,489)	(2,551)
O2	T6	Contingency factor (Operating Costs)	(2,847)	(4,904)	0	0	0	(438)	(449)	(460)	(471)	(483)	(495)	(508)	(520)	(533)	(547)
O3	T6	Third party revenue risk	(876)	(1,508)	0	0	0	(135)	(138)	(141)	(145)	(149)	(152)	(156)	(160)	(164)	(168)
O4	T6	Maintenance Risk: General	(5,702)	(9,821)	0	0	0	(877)	(899)	(921)	(944)	(968)	(992)	(1,017)	(1,042)	(1,068)	(1,095)
O6	T6	Contingency factor (Maintenance/Materials)	(1,156)	(1,991)	0	0	0	(178)	(182)	(187)	(191)	(196)	(201)	(206)	(211)	(216)	(222)
O7	T6	Performance Risk	(10,507)	(18,097)	0	0	0	(1,615)	(1,656)	(1,697)	(1,740)	(1,783)	(1,828)	(1,873)	(1,920)	(1,968)	(2,017)
O8	T6	Industrial Relations Risk	(7,005)	(12,065)	0	0	0	(1,077)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
O9	T7	Technology Risk	(23,406)	(40,622)	0	0	0	(2,261)	(3,477)	(5,940)	(2,435)	(3,744)	(6,397)	(2,623)	(4,032)	(6,888)	(2,824)
			(119,367)	(173,997)	(4,796)	(22,400)	(18,731)	(21,528)	(13,268)	(12,624)	(9,286)	(10,766)	(13,594)	(10,000)	(11,594)	(14,640)	(10,769)
Total Risk			(130,456)	(18,962)	0	(171)	(350)	(1,319)	(1,720)	(1,763)	(1,807)	(1,852)	(1,899)	(1,946)	(1,995)	(2,045)	(2,096)

Appendix D: Public Sector Comparator Financial Model – Advanced risk evaluation method

PSC Worked Example Hospital Project

Public Sector Comparator Financial Model - Advanced Risk Evaluation Method

Prepared by	[Insert name]
Spreadsheet Title	PSC Worked Example Hospital Project
Status	Final
File Reference	[Insert file name]

Contents

Software Specifications

Microsoft Excel 2000
Palisade @Risk v4.0.2

Operating Instructions

1 Inputs are shaded in light blue
2 Assumptions, with the exception of some timing assumptions, are entered on the "Assumptions" worksheet
3 Expenditure and risk timing assumptions are entered on the "Timing Asssumptions" worksheet
4 Key results are recorded on the "Outputs" worksheet

Notes to the Model

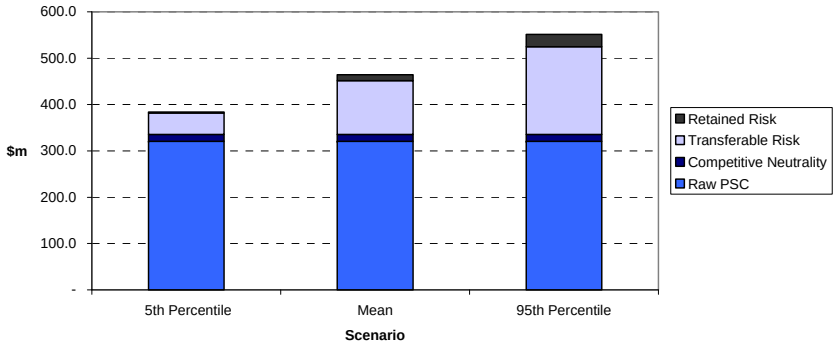
All units are in $'000s unless otherwise stated
Currency in Australian dollars

Outputs

Risk Adjusted Public Sector Comparator

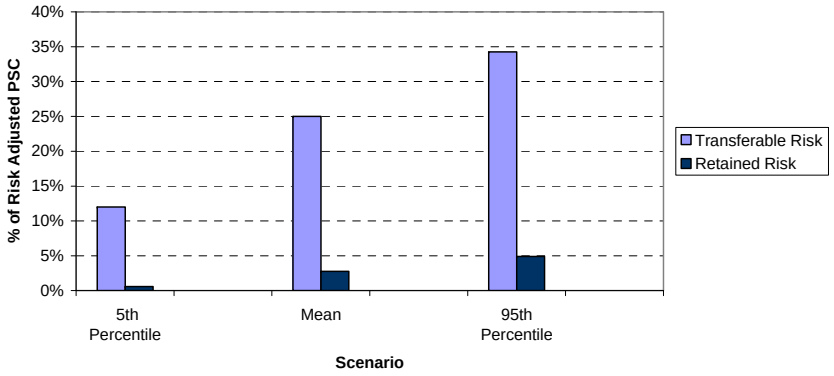
	5th Percentile		Mean		95th Percentile	
	($m)	%	($m)	%	($m)	%
Raw PSC	320.6	84%	320.6	69%	320.6	58%
Competitive Neutrality	15.0	4%	15.0	3%	15.0	3%
Transferable Risk	46.1	12%	116.0	25%	188.9	34%
Retained Risk	2.3	1%	12.8	3%	27.0	5%
Risk Adjusted PSC	384	100%	464	100%	552	100%

Notes
1. @Risk simulations have been run to determine transferable and retained risk
2. The 5% confidence limit is reported as the "Best Case"
3. The Mean is reported as the "Most Likely Case"
4. The 95% confidence limit is reported as the "Worst Case"



Transferable and Retained Risk

	% of Risk Adjusted PSC		
	5th Percentile	Mean	95th Percentile
Transferable Risk	12%	25%	34%
Retained Risk	1%	3%	5%
Total Risk	13%	28%	39%



Outputs

Sensitivity Analysis

	Movement in Assumption	PSC ($m)
Capital Expenditure	-15%	427.4
	-10%	439.7
	-5%	452.1
	0%	464.4
	5%	476.7
	10%	489.1
	15%	501.4
Operating Expenditure	-15%	451.1
	-10%	455.5
	-5%	460.0
	0%	464.4
	5%	468.8
	10%	473.3
	15%	477.7
Discount Rate	-15%	478.6
	-10%	474.4
	-5%	467.5
	0%	464.4
	5%	458.7
	10%	455.2
	15%	449.2
Inflation Rate	-15%	466.5
	-10%	465.1
	-5%	464.6
	0%	464.4
	5%	463.6
	10%	462.5
	15%	461.9
Maintenance/Refurbishment	-15%	455.8
	-10%	458.7
	-5%	461.5
	0%	464.4
	5%	467.3
	10%	470.1
	15%	473.0

Risk Distribution ($'000)

Percentile	Retained	Transferred	Total
Mean	12,791	116,010	128,801
5%	2,291	46,078	56,329
10%	4,098	61,217	71,251
15%	5,216	71,165	82,733
20%	6,136	78,973	92,581
25%	7,052	86,417	98,886
30%	8,022	92,694	105,054
35%	8,785	97,706	110,774
40%	9,689	103,672	117,689
45%	10,418	108,828	122,139
50%	11,306	115,159	127,462
55%	12,668	120,361	132,015
60%	13,989	125,415	137,541
65%	14,914	130,194	144,029
70%	16,285	137,021	150,535
75%	17,502	144,966	159,032
80%	18,931	154,584	166,845
85%	20,926	163,535	176,043
90%	23,211	173,037	186,797
95%	27,026	188,877	202,202

Outputs

Sensitivity Analysis - Transferable and Retained Risk ($m)

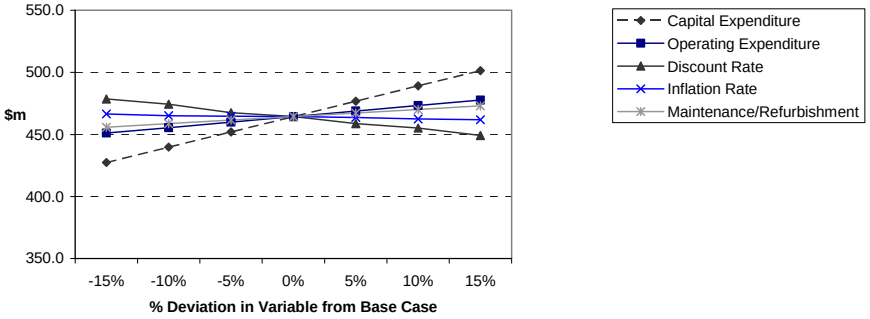
% Deviation in Variable from Base Case

Discount Rate	-15%	-10%	-5%	0%	5%	10%	15%
Transferable Risk	120.6	119.7	116.1	116.0	113.3	112.8	109.8
Retained Risk	13.2	13.0	12.8	12.8	12.7	12.6	12.5
	134	133	129	129	126	125	122
Inflation	-15%	-10%	-5%	0%	5%	10%	15%
Transferable Risk	117.7	116.6	116.2	116.0	115.3	114.2	113.6
Retained Risk	13.1	12.9	12.8	12.8	12.8	12.7	12.7
	131	129	129	129	128	127	126

Sensitivity Analysis - Results

		% Deviation in Variable from Base Case						
		-15%	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**
Capital Expenditure	($m)	427.4	439.7	452.1	464.4	476.7	489.1	501.4
Operating Expenditure	($m)	451.1	455.5	460.0	464.4	468.8	473.3	477.7
Discount Rate	($m)	478.6	474.4	467.5	464.4	458.7	455.2	449.2
Inflation Rate	($m)	466.5	465.1	464.6	464.4	463.6	462.5	461.9
Maintenance/Refurbishment	($m)	455.8	458.7	461.5	464.4	467.3	470.1	473.0

Sensitivity Chart



Note: The slight fluctuations in the discount rate and inflation rate variables are due to the need to re-run the @Risk simulations for each change in the variables to estimate the transferable and retained risk.

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Assumptions

General	Base Assumption	Assumption Used		Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Key Variables									
CPI Rate	2.5%	2.5%		Source:[DTF]	DTF	14-Mar-02	Report	Yes	
Discount Rate (real)	5.0%	5.0%		Source:[DTF]	DTF	6-Feb-02	Report	Yes	
Discount Rate (nominal)	7.62%	7.62%							
Cashflows discounted back to	1-Jul-02	1-Jul-02			Project Director	11-Nov-01	Report	No	Seek confirmation
General									
No. of months per period	12.00	12.00							

Capital Costs	Base Assumption	Assumption Used	CPI +/-	Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Timing									
Start Date	30-May-02	30-May-02			Project Brief	11-Nov-01	Report	No	Seek confirmation
Direct Costs									
Project Design	500	500	0.00%		Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
Land acquisition and development	5,000	5,000	0.00%	Based on market value	Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
D&C contract price	150,000	150,000	0.00%		Technical (Capital Cost) Advisor	18-Jan-02	Email	Yes	
Payments to Consultants	1,000	1,000	0.00%	Assume [ ]% of construction cost	Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
Acquisition of plant and equipment	50,000	50,000	0.00%	Assumes AUD/USD exchange rate of 0.57	Technical (Capital Cost) Advisor	14-Dec-01	Report	Yes	
Capital improvements to existing facilities	15,000	15,000	0.00%	Assumes 10% of D&C contract price	Technical (Capital Cost) Advisor	18-Jan-02	Email	Yes	
Required through-life capital expenditure	40,000	40,000	0.00%	Applied equally in years 5, 8 and 11 (3 year capital cycle)	Technical (Capital Cost) Advisor	18-Jan-02	Email	Yes	
Indirect Costs									
Construction overheads (annual)	1,000	1,000	0.00%		Technical (Capital Cost) Advisor	18-Jan-02	Report	Yes	

Operating and Maintenance Costs	Base Assumption	Assumption Used	CPI +/-	Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Timing									
Start Date	1-Jul-04	1-Jul-04			DTF	11-Nov-01	Report	No	Seek confirmation
Duration Years	10	10			DTF	11-Nov-01	Report	No	Seek confirmation
End Date	30-Jun-14	30-Jun-14							
Maintenance costs									
Maintenance and repairs	4,000	4,000	1.00%		Technical (Capital Cost) Advisor	1-Feb-02	Fax	Yes	
Direct operating costs									
Cost of materials	1,500	1,500	0.00%	Assumes [ ] % of capital cost	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Wages and salaries	5,000	5,000	1.00%	Assumes 100 EFT @ $50,000 p.a.	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Other employee costs	1,000	1,000	1.00%	Assumes [ ]% of wages and salaries	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Electricity, etc	2,000	2,000	0.00%	Assumes $[ ] per unit of electricity, $[ ] per unit of gas etc	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Direct management costs	1,000	1,000	0.00%		Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Insurance	1,250	1,250	0.00%		DTF	28-Feb-02	Email	Yes	
Indirect operating costs									
Operating overheads (annual)	200	200	0.00%	Based on [ ] sqm	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Administrative overheads	500	500	1.00%	Based on [ ] of staff	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Indirect capital cost allocation	100	100	0.00%	Based on historical data and projected costs	Technical (Operating cost) Advisor	1-Feb-02	Fax	Yes	
Third-party revenue									
Third-party revenue expected	5,000	5,000	0.00%	Includes car parking and retail revenue	Technical (Operating cost) Advisor	1-Feb-02	Fax	No	

Assumptions

Competitive Neutrality	Base Assumption	Assumption Used	Unit	Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Land Tax									
Base	0.06	0.06	$'000	$60 on land value to $200,000	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Threshold	200	200	$'000		Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Excess	0.002	0.002	$	0.2 cents for each dollar in excess of $200,000	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Local government rates	0.009	0.009	$	0.8725 cents per dollar of the value of the property	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Stamp duty	5.68%	5.68%	%p.a	Based on the stamp duty rates payable on the value of the land	Technical (Capital Cost) Advisor	5-Dec-01	Email	Yes	
Payroll tax	7.00%	7.00%	%p.a	7% of wages and salaries per year	Technical (Operating cost) Advisor	5-Dec-01	Email	Yes	

Sensitivity Analysis	Base Assumption	Assumption Used		Comments/Other	Source	Date	Reference Document	Sign-off	Actions
Capital Expenditure	0.00%	0.00%							
Operating Expenditure	0.00%	0.00%							
Discount rate	0.00%	0.00%							
Inflation rate	0.00%	0.00%							
Maintenance/Refurbishment	0.00%	0.00%							

PSC Worked Example Hospital Project

Timing Assumptions

Year number		0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending		30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Timing of Expenditure (%)														
Direct Costs														
	Project Design	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Land acquisition and development	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	D&C contract price	15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Payments to Consultants	33.33%	33.33%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Acquisition of plant and equipment	10.00%	30.00%	60.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Capital improvements to existing facilities	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Required through-life capital expenditure	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%
Indirect Costs														
	Construction overheads (annual)	100.00%	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Timing Flags for Risk														
Code	**Description**													
C	Construction Period	15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C3	End of Construction Period	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CO	Upgrading Periods	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%
O	Operating Period	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
O1	First year of operations	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
O2	Second year of operations	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
O10	Tenth year of operations	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
L	Project Period	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

PSC Worked Example Hospital Project

Risk Assumptions - Advanced probability technique

Risk	Description
S	Site risks
SC	Scope risks
SF	Sponsor & finance risk
D	Design risks
C	Construction risks
CO	Commissioning risk
L	Change in law risks
O	Operating risks
E	Energy risks
T	Technology risk

Timing	Description
C	Construction Period
C3	End of Construction Period
CO	Upgrading Periods
O	Operating Period
O1	First year of operations
O2	Second year of operations
O10	Tenth year of operations
L	Project Period

Notes to model

1 @Risk is required to run simulations through this model
2 Results for retained and transferable risk need to be extracted from @Risk and inserted into the "Outputs" worksheet
3 The 5% confidence limit is reported as the "Best Case"
4 The Mean is reported as the "Most Likely Case"
5 The 95% confidence limit is reported as the "Worst Case"
6 It is possible to sort the risks by category type using the Category codes
7 Qualitative risks are shaded:

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Retained	S1	Risk of lengthy approval time	C	Risk that the approval process is longer than anticipated.	Delay in works commencenent or completion and cost increases.	The State can ensure that approval time is conservative in planning Project timelines	*[insert name of risk expert/ source of risk estimate for each risk]*	22%	78%	800	1000	1200	1000.0	0	0
	S5	Native title risk	C	Risk of native title claims on the Site.	Delay in progess of construction and /or compensation to be paid to the claimants.	Undertake a search and inquiry		1%	99%	200	300	500	339.7	0	0
	S8	Site access	C	Risk that some of, or the entire site is not accessible as expected by the private party.	Delay in works commencement or completion and cost increases.	The State has purchased the preferred Site. Site access to be determined prior to tender.		15%	85%	100	150	400	229.9	0	0
	S13	Site availability	C	Risk that the designated site is unavailable.	Delay in works commencenent or completion and cost increases.	The State purchased the preferred site for the Hospital in early 2001.		7%	93%	750	800	1000	859.8	0	0
	SC1	Change in Hospital Operator requirements between now and Commissioning	C	Risk of changes to the service outputs required from the private party as specified by Hospital Operator	Delay in works commencement or completion and cost increases.	The State will absorb changes to the specifications in order for the private party to comply with the revised specifications.		22%	78%	200	250	350	269.8	0	0
	SC2	Change in Hospital Operator requirements between now and Commissioning	O	Risk of changes to the service outputs required from the private party as specified by Hospital Operator	Delay in works commencement or completion and cost increases.	The State will absorb changes to the specifications in order for the private party to comply with the revised specifications.		22%	78%	30	50	85	55.9	0	0

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Retained	SC3	Inadequate briefing of service specifications	C	Risk that service specifications are inadequately briefed	Facility may need to be redesigned or modified leading to increase in costs.	The State is to ensure that a communication strategy is developed for all stakeholders in the Project. The Service Profile is to be agreed with DHS and the Facility is specified to meet at least the generic brief which has been demonstrated as adequate for service delivery based on Hospital Operator experience.		44%	56%	500	600	800	639.7	0	0
	SC4	Inadequate briefing of service specifications	O	Facility may be inefficient leading to increase in recurrent costs.	Facility may need to be redesigned or modified leading to increase in costs.	The State is to ensure that a communication strategy is developed for all stakeholders in the Project.The Service Profile is to be agreed with DHS and the Facility is to be specified to meet at least the generic brief which has been demonstrated as adequate for service delivery based on Hospital Operator experience.		15%	85%	100	150	300	189.8	0	0
	SC5	Equipment specification	C	Risk that the specifications for equipment are inadequate.	Increase in costs and delay in operations.	The State will reimburse the reasonable costs incurred for any State initiated variations to the service specifications.		22%	78%	500	550	700	589.8	0	0
	SC6	Equipment specification	O1	Risk that the specifications for equipment are inadequate.	Increase in costs and delay in operations.	The State will reimburse the reasonable costs incurred for any State initiated variations to the service specifications.		22%	78%	200	350	500	350.0	0	0
	SC7	Clinical equipment specification	C	Risk that the specifications for clinical equipment are inadequate.	Increase in costs and delay in operations.	The State will reimburse the reasonable costs incurred for any State initiated variations to the service specifications. Use of backup equipment from other Hospital Operator hospitals.		22%	78%	2000	2500	4000	2897.7	0	0
	SC8	Clinical equipment specification	O	Risk that the specifications for clinical equipment are inadequate.	Increase in costs and delay in operations.	The State will reimburse the reasonable costs incurred for any State initiated variations to the service specifications. Use of backup equipment from other Hospital Operator hospitals.		22%	78%	1000	1200	1800	1359.1	0	0
	SC9	Local council requirements - Car parking	C	Risk that local council will require a significant increase in the car parking requirements.	Delay in works commencement or completion and cost increases.	Obtain council opinion on the car parking requirements as part of the approvals process.		15%	85%	50	75	200	114.9	0	0

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Retained	SC10	State Initiated Variations	C	Risk that the State changes the design, construction or commissioning requirements or service specifications.	Delay in works commencement or completion and cost increases.	The State will reimburse the reasonable costs incurred by the private party for any State initiated variations.		44%	56%	450	550	900	649.5	0	0
	SC11	State Initiated Variations	O	Risk that the State changes the design, construction or commissioning requirements or service specifications.	Delay in works commencement or completion and cost increases.	The State will reimburse the reasonable costs incurred by the operator for any State initiated variations.		44%	56%	300	350	550	409.8	0	0
	D3	Inadequate and inefficient circulation routes	C	Risk that the extent of circulation within functional units and travel between functional units do not support the operational requirements of the Hospital.	Increase in cost	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be approved by Hospital Operator.		15%	85%	100	120	400	224.8	0	0
	D4	Inadequate and inefficient circulation routes	O	Risk that the extent of circulation within functional units and travel between functional units do not support the operational requirements of the Hospital.	Increase in staff time to carry out their duties	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be approved by Hospital Operator.		15%	85%	50	65	90	69.0	0	0
	C3	Clinical equipment price changes	C	Risk that the price of clinical equipment will change from now to the end of construction phase.	Increase in costs			44%	56%	3000	3500	5000	3897.7	0	0
	O1	Design inefficiencies	O	Risk that the design of the Hospital is not efficient for staff to carry out their duties. This risk does not include inadequate and inefficient circulation routes.	Increase in staff time to carry out their duties and reduction in quality of patient care by Hospital Operator.	Hospital Operator to endorse clinical functionality of design prior to construction		22%	78%	100	250	400	250.0	0	0
	O2	Inability to attract sufficient clinical staff	O1	Risk that Hospital Operator is unable to employ the quality and number of staff required for the Hospital	Quality of Hospital Operator service to patients may suffer.	Allow sufficient lead time for recruitment, provision of incentives		22%	78%	200	500	1000	579.3	0	0

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Retained	L3	Change in Law risk	O	A change in Law which is limited in its application to any of the following: the Project, provision of publicly funded health care premises in Victoria, or other States within Australia including Victoria, or provision of health care accommodation services by the private sector to the public sector for operation as a publicly funded hospital in Victoria or other States within Australia including Victoria.	Adverse cost consequences in order to comply with the change.	This will be a retained risk		29%	71%	600	900	1500	1019.0	0	0
	SC17	Area requirement specification		Risk that the specifications of the area requirements are inadequate.	Facility may need to be redesigned or modified leading to increase in costs.	The State will reimburse the reasonable costs incurred by the private party for any State initiated variations to the service specifications.									
	D18	Future expansion design		Risk that the design of the building does not take into account the appropriate expansion of the Facility	Restriction in expansion options.	Discuss expansion requirements with Hospital Operator to ensure design reflects expected expansion requirements.									
	SF6	Risk of third party negligence.		The risk that third party negligence leads to a claim made against the State.	Potential litigation and increase in insurance premiums	The State will ensure that it will obtain third party insurance.									
	O3	GPs close their out of hours services		Risk that local GPs will close their out of hours services, hence unanticipated increase in patient demand on the hospital	Increase in costs	The State will conduct a detailed service specification incorporating future changes to GP out of hours services to ensure that unanticipated additional services/ facilities are kept to a minimum.									
	O4	Unexpected change in patient demand		Risk that expected demand for clinical services is different from that specified in the scope of the Project.	Delay and cost increases	The State will conduct a detailed service specification incorporating future projected changes in population where possible to ensure that unanticipated additional services/ facilities are kept to a minimum.									

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Retained	O5	Unexpected change in patient demand		Risk that expected demand for clinical services is different from that specified in the scope of the Project and therefore impacts on private sector services required.	Adverse cost consequences in order to comply with the change.	The State will conduct a detailed service specification incorporating future projected changes in population where possible to ensure that unanticipated additional services/ facilities are kept to a minimum.									
	O6	Emergency demand		Risk that Emergency demand is greater than expected.	Adverse cost consequences in order to comply with the change.	The State will undertake the appropriate research and using current projections make an informed estimate.									
	O7	ICU becomes mandatory for operating Emergency Department		Risk that standards change and intensive care units (ICU) become mandatory for operating an Emergency Department.	Adverse cost consequences in order to comply with the change.	The State will conduct a detailed service specification incorporating future projected changes in law where possible to ensure that unanticipated additional services/ facilities are kept to a minimum.									
	E5	Price risk - water		Risk that water prices will change above expectations.	Increase in water costs	Hospital Operator will be responsible for price risk on water.									
	E8	Volume/ usage risk - water only		Risk that the volume of water used is greater than anticipated.	Increase in water usage costs	Hospital Operator will be responsible for volume risk on water.									
	L10	Changes to building standards for hospitals		Risk that that changes in building standards impact the design and construction of the Hospital.	Delay in works commencement or completion and cost increases.										
	L11	Changes to health care operating standards		Risk that changes in health care operating standards will impact on the way service is delivered by Hospital Operator.	Adverse cost consequences in order to comply with the change.	This risk will be borne by Hospital Operator									
	L12	Changes to health care operating standards		Risk that changes in health care operating standards will impact on the way service is delivered by Hospital Operator.	Adverse cost consequences in order to comply with the change.	This risk will be borne by Hospital Operator									
Transferable	S2	Adverse drainage and groundwater conditions.	C	Risk of unanticipated adverse ground conditions especially in relation to drainage and groundwater.	Additional construction time and cost.	Undertake the requisite surveys in relation to drainage and groundwater conditions.		22%	78%	250	300	600	400.0	0	0
	S3	Adverse geological ground conditions.	C	Risk of unanticipated adverse ground conditions especially in relation to geotechnical ground conditions.	Additional construction time and cost.	Undertake a geotechnical site investigation assessment but the State will not provide any warranties or indemnities in relation to the information provided.		22%	78%	300	375	500	394.8	0	0

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	S6	Cultural heritage	C	Risk of cultural heritage discoveries	Delay in works commencement or completion and cost increases.	Undertake a search of the Victorian Heritage Register and undertake a survey of archaeological features.		15%	85%	100	250	350	230.2	0	0
	S7	Unidentified Flora and fauna	C	Risk that the designated Site contains protected species of flora and fauna.	Additional construction time and cost.	Undertake a study to assess whether the site has any flora, fauna or archaeological features of significance.		15%	85%	100	250	600	329.4	0	0
	S9	Inadequate water services	C	Risk that water services are inadequate to meet fire requirements.	Delay in works commencement or completion and cost increases.	The Private Party is responsible for ensuring the water services meet fire authority requirements		29%	71%	120	270	400	262.1	0	0
	S10	Unavailability of services to the site	C	Risk that services (power, gas, sewer, stormwater, roads) are unavailable to the Site.	Delay in works commencement or completion and cost increases.	The Private Party is responsible for ensuring the relevant services are available to the site.		22%	78%	150	200	400	259.8	0	0
	S11	Trade waste treatment	C	Risk that the requirement for the treatment of trade waste is to be conducted on site.	Delay in works commencement or completion and cost increases.	The Private Party is responsible for ensuring the treatment of trade waste complies with relevant standards		29%	71%	400	450	500	450.0	0	0
	S12	Trade waste treatment	O	Risk that the requirement for the treatment of trade waste is to be conducted on site.	Unexpected increase in operating cost	The Private Party is responsible for ensuring the treatment of trade waste complies with relevant standards		29%	71%	100	170	300	193.8	0	0
	SC12	Renegotiation of Victorian Building Industry Agreement	O	Risk that the renegotiation of the Victorian Building Industry Agreement produces an adverse result for the Project	Potential for decreased level of service from the Private Party, inability to meet service KPI's.	The Private Party is responsible for delivering the requisite services to the State specified KPI levels.		51%	49%	2750	3000	4000	3298.9	0	3298.916572
	D1	Inadequate design of gas and bulk chemicals storage	C	Risk that the design of gas and bulk chemicals storage is inadequate.	Delay in completion, increase in costs	Tight specification of the Commissioning specification		22%	78%	600	750	1000	789.6	0	0
	D2	Inadequate design of gas and bulk chemicals storage	O	Risk that the storage of gas and bulk chemicals storage is inadequate.	Gas and chemical supply may not be sufficient to service the Facility or for Hospital Operator staff to carry out their duties.	Tight specification of the Commissioning specification		22%	78%	200	250	400	289.8	0	0
	D8	Building is not orientated to achieve energy conservation	C	Risk that the design of the building is not oriented to maximise the environmental benefits of sun and light and to minimise deficiency of excessive heat gain, glare and wind.	Increase in energy volume and cost	Design of the building to be conducted by appropriately qualified experts and endorsed by the State.		29%	71%	550	600	800	659.8	0	0

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	D9	Building is not orientated to achieve energy conservation	O	Risk that the design of the building is not oriented to maximise the environmental benefits of sun and light and to minimise deficiency of excessive heat gain, glare and wind.	Increase in energy volume and cost	Design of the building to be conducted by appropriately qualified experts and endorsed by the State.		29%	71%	100	150	400	229.9	0	0
	D10	Inefficient design of the building in terms of safety and security for users	C	Risk that the design of the building impacts on appropriate vision and sight lines for all users of the Hospital	Injury to users, potential litigation and increase in insurance costs	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.		22%	78%	400	500	700	539.7	0	0
	D11	Inefficient design of the building in terms of safety and security for users	O	Risk that the design of the building impacts on appropriate vision and sight lines for all users of the Hospital	Injury to users, potential litigation and increase in insurance costs	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.		22%	78%	175	200	300	229.9	0	0
	D12	Design inefficiencies in terms of net area to gross area ratios	C	Risk that the design of the Facility is inefficient in terms of net area to gross area ratios.	Increased costs to rectify	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.		29%	71%	750	1000	2000	1298.9	0	0
	D13	Design inefficiencies in terms of net area to gross area ratios	O	Risk that the design of the Facility is inefficient in terms of net area to gross area ratios.	Increased costs to rectify	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.		29%	71%	300	450	800	529.4	0	0
	D14	Design inefficiencies in terms of sound transmission and reverberation	O2	Risk that the design does not control sound transmission and reverberation to a sufficient level.	Impact on Hospital Operator staff working conditions and quality of patient stay at the Facility. Increased cost to rectify.	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.		36%	64%	850	900	1000	919.8	0	0
	D17	Design does not take into account clinical functionality	O2	Risk that the design is not fit for purpose in terms of clinical functionality	Delay and costs	The design of the building is the responsibility of the Private Party unless the problem arose due to inaccurate specifications by the State. The State will endorse that the design meets the clinical functionality requirements.		22%	78%	750	800	1000	859.8	0	0
	C1	Construction costs	C	Risk that construction cost estimates materially change between bid and implementation due to changes in underlying costs (labour or materials).	Increase in cost	Ensure that the PSC cost estimate correctly reflects the Reference Project.		58%	42%	30000	32000	40000	34391.3	0	34391.33258
	C2	Equipment price changes	C	Risk that the price of equipment will change from now to construction period.	Increase in costs			44%	56%	800	880	1000	895.8	0	0

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	C4	Substandard building	O	Risk that the final building does not meet quality standards.	Delay in works commencement or completion and cost increases.	A Commissioning process and the appointment of an Independent reviewer will help to ensure that the final product complies with the requisite standards and quality.		36%	64%	250	300	400	319.8	0	0
	C5	Substandard building	C3	Risk that the final building does not meet quality standards.	Impact on Hospital Operator quality of service to patients of the Facility and increases in cost.	A Commissioning process and the appointment of an Independent reviewer will help to ensure that the final product complies with the requisite standards and quality.		36%	64%	100	120	200	143.9	0	0
	C6	Industrial relations and civil commotion	C	Risks of strikes, industrial action or civil commotion during the Construction Phase	Delay and costs	The Private Party or its sub contractors are to manage Project delivery and operations.		58%	42%	750	800	900	819.8	0	819.8325413
	C8	Breach of OH&S Standards	C	Risk that a breach of the OH&S Standards occurs during Construction Phase.	Additional construction time and cost.	The Contractor is to develop an OH&S plan and maintain a safe site.		22%	78%	600	650	800	689.8	0	0
	C9	Risk of unexpectedly long lead times for equipment.	C3	Risk that equipment that is purchased from overseas does not arrive on time.	Delay in construction or completion			29%	71%	8000	8500	10000	8897.7	0	0
	C10	Time Overrun	C	Risk of not meeting construction programme timeline	Delay in construction or completion			50%	50%	22000	25000	30000	25792.7	0	0
	C11	Upgrade Costs	CO	Risk of upgrade of equipment costs	Increase in costs			58%	42%	10000	12000	15000	12396.2	0	12396.18574
	CO1	Commissioning program for other authorities is inadequate (eg, fire, ambulance)	C3	Risk that the Commissioning program for other authorities is inadequate (eg, fire, ambulance)	Delay in works commencement or completion and cost increases.	The private party is responsible for the ensuring that the Hospital meets the commissioning tests.		22%	78%	100	250	500	289.6	0	0
	CO2	Commissioning cannot be successfully completed.	C3	Risk that the operational commissioning tests which are required for the provision of services to commence cannot be successfully completed. This includes the risk that delay could also be due to the building being ready, but lag time for equipment to be in place and ready for use.	Delay in Hospital Operator commencement of services. Liquidated damages will be calculated at on a daily basis.	The private party is responsible for ensuring that the Hospital meets the commissioning tests. Liquidated damages apply if delay in Hospital Operator service is caused by the private party .		15%	85%	14000	15000	18000	15795.3	0	0
	O14	Operating costs are underestimated.	O	Risk that operating costs in relation to services are underestimated.	Increase in costs	The Private Party will be responsible for ensuring that their operating cost estimates are reasonable.		45%	55%	2000	2500	4000	2897.7	0	0

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	O15	Private Party performance risk	O	Risk that the private party does not meet the Service KPIs	Increase in cost to rectify.	The payment mechanism is linked to meeting service KPI's which the Private Party is responsible for achieving otherise deductions will be made.		40%	60%	4000	4500	6000	4897.7	0	0
	O16	Equipment risk due to change in OH&S standards	O10	Risk that the Category 2 equipment (furniture and fixtures) breaches the OH&S standards due to a change in law	Increase in cost to rectify.	The State will undertake the appropriate research of the OH&S Standards in their detailed service specification to ensure that unanticipated additional services / facilities are kept to a minimum.		25%	75%	2000	2200	4000	2842.5	0	0
	O17	Traffic accident review	O2	Risk that a traffic review of the Traffic Management Plan may lead to a forced change in the carparking design.	Potential need to increase size of car park or design of car park leading to increase in costs.	The State will conduct a detailed service specification incorporating possible scenarios in relation to traffic management to ensure that unanticipated additional services/ facilities are kept to a minimum.		36%	64%	100	150	300	189.8	0	0
	O18	Maintenance and refurbishment risk	O	Risk that design and or construction quality is inadequate resulting in higher than anticipated refurbishment costs.	Increase in cost which may also result in a corresponding adverse effect on the Hospital Operator's ability to deliver core services.	The private party is to manage this risk through suitably qualified and resourced subcontractors and through consultation process with the State.		40%	60%	5000	6000	8000	6396.7	0	0
	O19	Maintenance and refurbishment risk	O	Risk that design and or construction quality is inadequate resulting in higher than anticipated maintenance costs.	Increase in cost which may also result in a corresponding adverse effect on the Hospital Operator's ability to deliver core services.	The private party is to manage this risk through suitably qualified and resourced subcontractors and through consultation process with the State.		40%	60%	1250	1500	2000	1599.2	0	0
	O20	Security	O	All risks associated with security for the Hospital including the risks that operating costs and / or industry standards change over the term of the Project.	Increase in cost which may also result in a corresponding adverse effect on the Hospital Operator's ability to deliver the Hospital's core services.	The private party is to manage this risk through long term subcontracts with suitably qualified and resourced subcontractors and through consultation processes with the State.		22%	78%	100	125	300	185.1	0	0
	O21	Security	O	All risks associated with security for the Hospital including the risks that operating costs and / or industry standards change over the term of the Project.	Increase in cost which may also result in a corresponding adverse effect on the Hospital Operator's ability to deliver the Hospital's core services.	The private party is to manage this risk through long term subcontracts with suitably qualified and resourced subcontractors and through consultation processes with the State.		22%	78%	80	100	250	152.1	0	0
	O22	Car park	O	All risks associated with the car park including the risks that operating costs and / or industry standards change over the term of the Project.	Increase in cost which may also result in a corresponding adverse effect on the Hospital Operator's ability to deliver the Hospital's core services.	The private sector will manage the car park within the parameters advised by the State. Should the Hospital Operator wish to change these parameters, this will require agreement with the State before implementation.		15%	85%	750	800	1000	859.8	0	0
	O25	Third-party revenue risk	O	Risk that third party revenue is different from expectations				50%	50%	550	600	800	659.8	0	0

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	E1	Efficiency of energy systems	C	Risk that energy systems are less efficient than expected.	Increase in costs	The Private Party is responsible for ensuring efficiency in energy systems, and the State may specify that systems are to meet efficiency requirements.		25%	75%	750	800	1000	859.8	0	0
	E2	Efficiency of energy systems	O	Risk that energy systems are less efficient that than expected.	Increase in energy costs	The Private Party is responsible for ensuring efficiency in energy systems, and the State may specify that systems are to meet efficiency requirements.		25%	75%	300	325	400	344.9	0	0
	E3	Availability of energy	O	Risk that the energy supply is not available as required by Hospital Operator.	Loss of Hospital Operator services.	The Private Party is responsible for ensuring availability of energy systems, and the State will also specify adequate backup systems and procedures.		22%	78%	900	1000	1250	1059.6	0	0
	T1	Technology Risk	O	Risk that the design life of the Hospital infrastructure proves to be shorter than anticipated resulting in earlier than anticipated refurbishment expense.	Additional capital and / or maintenance costs incurred.	The Private Party may have recourse to the designer, builder, maintenance provider or their insurers.		30%	70%	600	650	900	729.9	0	0
	L1	Employer superannuation contributions	O	Risk that the Federal Government will increase the level of employer superannuation contributions.	Adverse cost consequences in order to comply with the change.	The private party will bear the risk of changes in their labour related costs		22%	78%	100	120	200	143.9	0	0
	S14	Approvals risk		Risk that necessary approvals cannot be obtained or may be obtained subject to unanticipated conditions that have adverse cost consequences or cause delay in the progress of the Works.	Delay in works commencenent or completion and cost increases.	The Private Party will be responsible for obtaining the requisite planning approvals from the local government for the proposed developments.									
	C7	Industrial relations and civil commotion		Risks of strikes, industrial action or civil commotion during the Operating Phases.	Delay and costs	The Private Party or its sub contractors is to manage Project delivery and operations.									
	CO3	Commissioning program is inadequate (building)		Risk that the building commissioning program does not incorporate all the relevant standards and is therefore inadequate.	Delay in construction or completion	The private party is responsible for ensuring that the Hospital meets the commissioning tests.									

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	CO4	Commissioning program is inadequate (human commissioning)		Risk that human commissioning program which primarily relates to staff training regarding how the building operates is inadequate.	Delay in the commencement of Hospital Operator operations and/or impact on Hospital Operator quality of service to patients.	The private party is responsible for ensuring that the Hospital meets the commissioning tests.									
	SF2	Foreign exchange rate movement - (engineering equipment purchased overseas)		Risk of adverse movements in Foreign exchange rates in relation to engineering equipment	Increase in cost	The Private Party can hedge their exposure to foreign exchange.									
	O10	Changes in development around the hospital		Risk that changes in local use and future developments around the hospital have an adverse impact on the hospital, eg fall in water pressure.	Adverse cost consequences in order to comply with the change.	The State will undertake the appropriate research of the surrounding area and incorporate this in their detailed service specification to ensure that unanticipated additional services / facilities are kept to a minimum.									
	O11	Changes in development around the hospital		Risk that changes in local use and future developments around the hospital have an adverse impact on the hospital, eg fall in water pressure.	Adverse cost consequences in order to comply with the change.	The State will undertake the appropriate research of the surrounding area and incorporate this in their detailed service specification to ensure that unanticipated additional services / facilities are kept to a minimum.									
	O23	Car park		All risks associated with the car park including the risks that operating costs and / or industry standards change over the term of the Project.	Increase in cost which may also result in a corresponding adverse effect on the Hospital Operator's ability to deliver the Hospital's core services.	The private sector will manage the car park within the parameters advised by the State. Should the Hospital Operator wish to change these parameters, this will require agreement with the State before implementation.									
	O24	Slow response to help desk calls		Risk that slow response to help desk calls results in someone incurring an injury.	Reduction in service payments to the Private Party, potential litigation by the injured person.	The payment mechanism is linked to meeting service KPIs which the Private Party is responsible for achieving.									
	E4	Availability of energy		Risk that the energy supply is not available as required by Hospital Operator.	Loss of Hospital Operator services.	The Private Party is responsible for ensuring availability of energy systems, and the State will also specify adequate backup systems and procedures.									
	E6	Price risk - electricity and gas		Risk that electricity and gas prices will change above expectations.	Increase in energy costs	This will be a shared risk as an estimated 70% of electricity and gas usage is due to infrastructure and the remaining 30% is operational.									
	E7	Volume/ usage risk - electricty and gas		Risk that the volume of electricity and gas used is greater than anticipated.	Increase in electricity and gas costs	This will be a shared risk as an estimated 70% of electricity and gas usage is due to infrastructure and the remaining 30% is operational.									

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Transferable	L4	Change in State legislation		Risk of changes in State legislation which does not take into account L3	Adverse cost consequences in order to comply with the change.	General changes in the business environment are part of the Private Party's general business risk profile.									
	L5	Change in Federal legislation		Risk of changes in Federal legislation especially in the areas of insurance and aged care that are not included in L3	Adverse cost consequences in order to comply with the change.	General changes in the business environment are part of the Private Party's general business risk profile.									
	L6	Change in Government policy		Risk of changes to Government policy, especially with regard to industrial relations requirements that are not included in L3	Adverse cost consequences in order to comply with the change.	General changes in the business environment are part of the Private Party's general business risk profile.									
Shared	S4	Environmental risk	C	Risk that the site is contaminated requiring significant expense to remedy.	Clean up costs which could result in delays.	Undertake a site contamination assessment. As this is a green field site located on the urban fringe, it is unlikely that contamination risk will be an issue.		22%	78%	2000	3500	6000	3896.3	0	0
	D5	Lengthy detailed design time	C	Risk that detailed design time is longer than anticipated	Delay in works commencement or completion and cost increases.			36%	64%	8000	8500	10000	8897.7	0	0
	D6	Local community protest	C	Risk of adverse reaction and protest from local community to the Project.	Delay in works commencement or completion and cost increases.	Allow sufficient time for community consultation.		15%	85%	1500	2000	4000	2597.8	0	0
	D7	Local community protest	O	Risk of adverse reaction and protest from local community to the Project.	Delay in works commencement or completion and cost increases.	Allow sufficient time for community consultation.		15%	85%	1100	1200	1500	1279.5	0	0
	SF5	Risk of obtaining insurance cover	L	Risk of inability to obtain insurance or material increases in insurance premiums eg, construction, third party, professional indemnity, collapse of insurance company, WorkCover.	Material increases in premiums priced into the bid by the Private Party or inability to obtain the relevant insurance.	This risk is shared due to the uncertain situation regarding insurance since September 11 2001, it is expected that availability of insurance will decrease or increases in premiums will occur.		44%	56%	2000	3000	5000	3396.7	0	0
	SC13	Lengthy negotiation of changes to specifications		Risk of lengthy negotiations between stakeholders on what is a legitimate change to the service specifications.	Delay in works commencement or completion and cost increases.	Agree with all stakeholders a dispute resolution process.									

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Shared	SC14	Negotiation of changes to specifications		Risk of lengthy negotiations between stakeholders on what is a legitimate change to the service specifications.	Impact on Hospital Operator quality of service to patients of the Facility and increases in cost	Agree with all stakeholders a dispute resolution process.									
	SC15	Service required from private sector is higher than expected or does not meet expectations.		Risk that demand for private party services differs from the expected level, ie maintenance works are higher than expected due to unanticipated increase in patient demand	Increase in costs	The State will conduct a detailed service specification incorporating future projected changes in population where possible to ensure that unanticipated additional services/ facilities are kept to a minimum.									
	D15	Contamination or infection caused by inadequate design layout of clinical areas		Risk that the design or the layout leads to contamination or infection with regard to the clinical functionality of the area.	Impact on Hospital Operator quality of service to patients of the Facility and increases in cost.	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.									
	D16	Contamination or infection caused by inadequate design layout of clinical areas		Risk that the design or the layout leads to contamination or infection with regard to the clinical functionality of the area.	Impact on Hospital Operator quality of service to patients of the Facility and increases in cost.	Design of the building to be conducted by appropriately qualified experts and clinical functionality is to be endorsed by the State.									
	SF1	Foreign exchange rate movement -(medical equipment purchased overseas)		Risk of adverse movements in foreign exchange rates in relation to the purchase of medical equipment	Increase in cost	The Private Party can hedge their exposure to foreign exchange.									
	SF3	Risk of material changes in inflation.		Risk that the value of payments made/ received during the term is eroded by inflation	Diminution in real returns of the Private Party.	Private party takes the risk on the methodology adopted to maintain value, however the State shares risk to the extent of agreed indexation									
	L2	Change in law/policy		A change in Law which is limited in its application to any of the following: the Project, provision of publicly funded health care premises in Victoria, or other States within Australia including Victoria, or provision of health care accommodation services by the private sector to the public sector for operation as a publicly funded hospital in Victoria or other States within Australia including Victoria.	Adverse cost consequences in order to comply with the change.	This will be a shared risk depending on the nature of the change.									

Risk Assumptions - Advanced probability technique

Allocation	Category Codes	Risk	Timing	Description	Consequence	Rationale/Mitigation	Risk Expert	Probability		Consequence			@ Risk Distribution		@ Risk Discrete Distrib'n
								Yes	No	Best	Most likely	Worst	Yes	No	
Shared	L14	Other authority changes		Risk of authority changes which impact for example, the design of cooling towers.	Adverse cost consequences in order to comply with the change. Impact on Hospital Operator operational service.										
	F1	Force Majeure		Risk of inability to provide any aspect of the Project caused by a force majeure event.	Delay and costs	The State will share in reinstatement costs with the private party to resume services.									
	F2	Force Majeure		Risk of inability to provide any aspect of the Project caused by a force majeure event.	Increase in costs	The State will share in reinstatement costs with the private party to resume services.									

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Raw PSC

	NPC	Nominal	0	1	2	3	4	5	6	7	8	9	10	11	12
Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending			30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Cashflows															
Total Construction Costs	(234,430)	(282,991)	(34,333)	(70,554)	(88,077)	(24,230)	-	(32,057)	-	-	(16,245)	-	-	(17,494)	-
Total Operating and Maintenance Costs	(86,183)	(149,240)	-	-	-	(12,772)	(13,208)	(13,659)	(14,125)	(14,607)	(15,106)	(15,622)	(16,155)	(16,707)	(17,278)
Raw PSC	(320,613)	(432,231)													
Discount Factor															
Discount Factor			1.000	0.929	0.864	0.802	0.745	0.693	0.644	0.598	0.555	0.516	0.480	0.445	0.414
Timing of Expenditure (%)															
Direct Costs															
Project Design			100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Land acquisition and development			100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
D&C contract price			15.00%	35.00%	35.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Payments to Consultants			33.33%	33.33%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acquisition of plant and equipment			10.00%	30.00%	60.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Capital improvements to existing facilities			0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Required through-life capital expenditure			0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%
Indirect Costs															
Construction overheads (annual)			100.00%	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Operating Period			0.00%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Inflation Factors - Capital Costs															
Direct Costs															
Project Design			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Land acquisition and development			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
D&C contract price			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Payments to Consultants			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Acquisition of plant and equipment			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Capital improvements to existing facilities			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Required through-life capital expenditure			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Indirect Costs															
Construction overheads (annual)			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Inflation Factors - Operations and Construction															
Maintenance costs															
Maintenance and repairs			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Direct operating costs															
Cost of materials			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Wages and salaries			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Other employee costs			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Electricity, etc			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Direct management costs			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Insurance			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345

Raw PSC

Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending			30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Indirect operating costs															
Operating overheads (annual)			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Administrative overheads			1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511
Indirect capital cost allocation			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Third-party revenue															
Third-party revenue expected			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Capital Costs															
Direct Costs															
Project Design	(500)	(500)	(500)	-	-	-	-	-	-	-	-	-	-	-	-
Land acquisition and development	(5,001)	(5,000)	(5,000)	-	-	-	-	-	-	-	-	-	-	-	-
D&C contract price	(139,589)	(155,700)	(22,500)	(53,813)	(55,158)	(24,230)	-	-	-	-	-	-	-	-	-
Payments to Consultants	(953)	(1,025)	(333)	(342)	(350)	-	-	-	-	-	-	-	-	-	-
Acquisition of plant and equipment	(46,511)	(51,894)	(5,000)	(15,375)	(31,519)	-	-	-	-	-	-	-	-	-	-
Capital improvements to existing facilities	(11,753)	(16,971)	-	-	-	-	-	(16,971)	-	-	-	-	-	-	-
Required through-life capital expenditure	(27,262)	(48,825)	-	-	-	-	-	(15,085)	-	-	(16,245)	-	-	(17,494)	-
Indirect Costs															
Construction overheads (annual)	(2,860)	(3,076)	(1,000)	(1,025)	(1,051)	-	-	-	-	-	-	-	-	-	-
Total Construction Costs	(234,430)	(282,991)	(34,333)	(70,554)	(88,077)	(24,230)	-	(32,057)	-	-	(16,245)	-	-	(17,494)	-
Operating and Maintenance Costs															
Maintenance costs															
Maintenance and repairs	(30,030)	(52,027)	-	-	-	(4,435)	(4,590)	(4,751)	(4,917)	(5,089)	(5,267)	(5,452)	(5,642)	(5,840)	(6,044)
Direct operating costs															
Cost of materials	(10,507)	(18,097)	-	-	-	(1,615)	(1,656)	(1,697)	(1,740)	(1,783)	(1,828)	(1,873)	(1,920)	(1,968)	(2,017)
Wages and salaries	(37,537)	(65,034)	-	-	-	(5,544)	(5,738)	(5,938)	(6,146)	(6,361)	(6,584)	(6,814)	(7,053)	(7,300)	(7,555)
Other employee costs	(7,507)	(13,007)	-	-	-	(1,109)	(1,148)	(1,188)	(1,229)	(1,272)	(1,317)	(1,363)	(1,411)	(1,460)	(1,511)
Electricity, etc	(14,009)	(24,130)	-	-	-	(2,154)	(2,208)	(2,263)	(2,319)	(2,377)	(2,437)	(2,498)	(2,560)	(2,624)	(2,690)
Direct management costs	(7,005)	(12,065)	-	-	-	(1,077)	(1,104)	(1,131)	(1,160)	(1,189)	(1,218)	(1,249)	(1,280)	(1,312)	(1,345)
Insurance	(8,756)	(15,081)	-	-	-	(1,346)	(1,380)	(1,414)	(1,450)	(1,486)	(1,523)	(1,561)	(1,600)	(1,640)	(1,681)
Indirect operating costs															
Operating overheads (annual)	(1,401)	(2,413)	-	-	-	(215)	(221)	(226)	(232)	(238)	(244)	(250)	(256)	(262)	(269)
Administrative overheads	(3,754)	(6,503)	-	-	-	(554)	(574)	(594)	(615)	(636)	(658)	(681)	(705)	(730)	(756)
Indirect capital cost allocation	(700)	(1,206)	-	-	-	(108)	(110)	(113)	(116)	(119)	(122)	(125)	(128)	(131)	(134)
Third-party revenue															
Third-party revenue expected	35,024	60,324	-	-	-	5,384	5,519	5,657	5,798	5,943	6,092	6,244	6,400	6,560	6,724
Total Operating and Maintenance Costs	(86,183)	(149,240)	-	-	-	(12,772)	(13,208)	(13,659)	(14,125)	(14,607)	(15,106)	(15,622)	(16,155)	(16,707)	(17,278)
Raw PSC	(320,613)	(432,231)	(34,333)	(70,554)	(88,077)	(37,002)	(13,208)	(45,715)	(14,125)	(14,607)	(31,351)	(15,622)	(16,155)	(34,202)	(17,278)

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Competitive Neutrality

Year number			0	1	2	3	4	5	6	7	8	9	10	11	12
Year ending			30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Cashflows	**NPC**	**Nominal**													
Competitive Neutrality	(14,985)	(24,094)	(284)	(1,396)	(1,431)	(1,855)	(1,905)	(1,957)	(2,010)	(2,064)	(2,120)	(2,178)	(2,237)	(2,298)	(2,360)
Discount Factor															
Discount Factors			1.000	0.929	0.864	0.802	0.745	0.693	0.644	0.598	0.555	0.516	0.480	0.445	0.414
Inflation Factor															
Inflation Factor			1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Competitive Neutrality															
Land Tax	(85)	(135)	-	(10)	(10)	(10)	(11)	(11)	(11)	(11)	(12)	(12)	(12)	(13)	(13)
Local government rates	(11,988)	(19,123)	-	(1,386)	(1,421)	(1,456)	(1,493)	(1,530)	(1,568)	(1,608)	(1,648)	(1,689)	(1,731)	(1,774)	(1,819)
Stamp duty	(284)	(284)	(284)	-	-	-	-	-	-	-	-	-	-	-	-
Payroll tax	(2,628)	(4,552)	-	-	-	(388)	(402)	(416)	(430)	(445)	(461)	(477)	(494)	(511)	(529)
Total	(14,985)	(24,094)	(284)	(1,396)	(1,431)	(1,855)	(1,905)	(1,957)	(2,010)	(2,064)	(2,120)	(2,178)	(2,237)	(2,298)	(2,360)

PSC Worked Example Hospital Project

All units are in '000s unless otherwise stated

Risk - Advanced

				0	1	2	3	4	5	6	7	8	9	10	11	12
Year number																
Year ending				30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
Summary Risks			**NPC**													
Retained			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transferable			64,324	5,282	12,632	12,948	9,240	3,641	8,407	3,826	3,921	9,054	4,120	4,223	9,750	4,437
			64,324	**5,282**	**12,632**	**12,948**	**9,240**	**3,641**	**8,407**	**3,826**	**3,921**	**9,054**	**4,120**	**4,223**	**9,750**	**4,437**
Discount Factor																
Discount Factor				1.000	0.929	0.864	0.802	0.745	0.693	0.644	0.598	0.555	0.516	0.480	0.445	0.414
Financial Indices																
Inflation factors				1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345
Timing Flags																
	C	Construction Period		0.15	0.35	0.35	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C3	End of Construction Period		0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO	Upgrading Periods		0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.33	0.00	0.00	0.33	0.00
	O	Operating Period		0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	O1	First year of operations		0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	O2	Second year of operations		0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	O10	Tenth year of operations		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	L	Project Period		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Risks																
Risk ID	Timing	**Risks**														
Retained																
S1	C	Risk of lengthy approval time	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S5	C	Native title risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S8	C	Site access	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S13	C	Site availability	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC1	C	Change in Hospital Operator requirements between now and Commissioning	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC2	O	Change in Hospital Operator requirements between now and Commissioning	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3	C	Inadequate briefing of service specifications	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC4	O	Inadequate briefing of service specifications	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC5	C	Equipment specification	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC6	O1	Equipment specification	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC7	C	Clinical equipment specification	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC8	O	Clinical equipment specification	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC9	C	Local council requirements - Car parking	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC10	C	State Initiated Variations	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC11	O	State Initiated Variations	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D3	C	Inadequate and inefficient circulation routes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D4	O	Inadequate and inefficient circulation routes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C3	C	Clinical equipment price changes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O1	O	Design inefficiencies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O2	O1	Inability to attract sufficient clinical staff	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L3	O	Change in Law risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transferable																
S2	C	Adverse drainage and groundwater conditions.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S3	C	Adverse geological ground conditions.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S6	C	Cultural heritage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S7	C	Unidentified Flora and fauna	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S9	C	Inadequate water services	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S10	C	Unavailability of services to the site	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S11	C	Trade waste treatment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S12	O	Trade waste treatment	0	0	0	0	0	0	0	0	0	0	0	0	0	0

				0	1	2	3	4	5	6	7	8	9	10	11	12
Year number																
Year ending				30-Jun-2002	30-Jun-2003	30-Jun-2004	30-Jun-2005	30-Jun-2006	30-Jun-2007	30-Jun-2008	30-Jun-2009	30-Jun-2010	30-Jun-2011	30-Jun-2012	30-Jun-2013	30-Jun-2014
SC12	O	Renegotiation of Victorian Building Industry Agreement	23,108	0	0	0	3,553	3,641	3,732	3,826	3,921	4,019	4,120	4,223	4,328	4,437
D1	C	Inadequate design of gas and bulk chemicals storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D2	O	Inadequate design of gas and bulk chemicals storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D8	C	Building is not orientated to achieve energy conservation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D9	O	Building is not orientated to achieve energy conservation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D10	C	Inefficient design of the building in terms of safety and security for users	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D11	O	Inefficient design of the building in terms of safety and security for users	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D12	C	Design inefficiencies in terms of net area to gross area ratios	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D13	O	Design inefficiencies in terms of net area to gross area ratios	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D14	O2	Design inefficiencies in terms of sound transmission and reverberation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D17	O2	Design does not take into account clinical functionality	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C1	C	Construction costs	32,004	5,159	12,338	12,646	5,555	0	0	0	0	0	0	0	0	0
C2	C	Equipment price changes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C4	O	Substandard building	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C5	C3	Substandard building	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C6	C	Industrial relations and civil commotion	763	123	294	301	132	0	0	0	0	0	0	0	0	0
C8	C	Breach of OH&S Standards	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C9	C3	Risk of unexpectedly long lead times for equipment.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C10	C	Time Overrun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C11	CO	Upgrade Costs	8,449	0	0	0	0	0	4,675	0	0	5,035	0	0	5,422	0
CO1	C3	Commissioning program for other authorities is inadequate (eg, fire, ambulance)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO2	C3	Commissioning cannot be successfully completed.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O14	O	Operating costs are underestimated.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O15	O	Private Party performance risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O16	O10	Equipment risk due to change in OH&S standards	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O17	O2	Traffic accident review	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O18	O	Maintenance and refurbishment risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O19	O	Maintenance and refurbishment risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O20	O	Security	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O21	O	Security	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O22	O	Car park	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O25	O	Third-party revenue risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E1	C	Efficiency of energy systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E2	O	Efficiency of energy systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E3	O	Availability of energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T1	O	Technology Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L1	O	Employer superannuation contributions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			64,324	5,282	12,632	12,948	9,240	3,641	8,407	3,826	3,921	9,054	4,120	4,223	9,750	4,437
Shared - Retained																
S4	C	Environmental risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D5	C	Lengthy detailed design time	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D6	C	Local community protest	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D7	O	Local community protest	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SF5	L	Risk of obtaining insurance cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shared - Transferable																
S4	C	Environmental risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D5	C	Lengthy detailed design time	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D6	C	Local community protest	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D7	O	Local community protest	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SF5	L	Risk of obtaining insurance cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Risk			64,324	5,282	12,632	12,948	9,240	3,641	8,407	3,826	3,921	9,054	4,120	4,223	9,750	4,437

Risk Output

Retained	0
Transferable	64,324
Total	64,324

Note:

This worksheet models the timing of risks for the Advanced Valuation Technique. As this technique is run as a simulation through this model in @Risk, the above zero's are not the risk output. As the likelihood of the risk occurring is less than 50% the zero represents the fact that in the base case the most likely value of the risk is zero. In other words, this represents one simulation compared to @Risk where, for example, up to 5000 simulations are run.