MOODY'S INVESTORS SERVICE

RATING METHODOLOGY

Construction Risk in Privately-Financed Public Infrastructure (PFI/PPP/P3) Projects

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Analyst Contacts:

TORONTO +1.416.214.1635

Catherine N. Deluz +1.416.214.3836
Senior Vice President
catherine.deluz@moodys.com

Louis Ko +1.416.214.3638
Vice President – Senior Analyst
louis.ko@moodys.com

NEW YORK +1.212.553.1653

Angelo Sabatelle +1.212.553.4136
Associate Managing Director
angelo.sabatelle@moodys.com

John Medina +1.212.553.3604
Vice President – Senior Analyst
john.medina@moodys.com

Kathrin Heitmann +1.212.553.4694
Assistant Vice President – Analyst
kathrin.heitmann@moodys.comvp

» contacts continued on the last page

This updated rating methodology replaces "Construction Risk in Privately-Financed Public Infrastructure (PFI/PPP/P3) Projects" last updated on April 10, 2014. The changes include a footnote to explain our use of credit assessments for constructors and removal of issuer-specific information. No ratings will be impacted by these changes.

Summary

This rating methodology explains Moody's approach to assessing credit risk for privately-financed public infrastructure (PFI/PPP/P3) projects in construction globally. This document is intended to provide general guidance that helps companies, investors, and other interested market participants understand how key qualitative and quantitative risk characteristics are likely to affect rating outcomes for PFI/PPP/P3 projects in construction. This document does not include an exhaustive treatment of all factors that are reflected in Moody's ratings but should enable the reader to understand the qualitative considerations and financial information and ratios that are usually most important for ratings in this sector.

This methodology only applies to PFI/PPP/P3 projects in construction where the sponsoring government will pay for the infrastructure asset either upon certain construction milestones being reached and/or through availability payments covering operating and maintenance costs, debt service and equity returns with such payment only being subject to availability and performance risk. The related methodology is the methodology applicable to PFI/PPP/P3 projects in operations "Operating Risk in Privately-Financed Public Infrastructure (PFI/PPP/P3) Projects". At financial close, the lower of the two ratings (the rating during construction and the rating during the operating phase) will apply.

This report includes a detailed rating grid. The grid is a reference tool that can be used to approximate credit profiles within the sector of PFI/PPP/P3 projects in construction in most cases. The grid provides summarized guidance for most of the factors that are generally most important in assigning ratings to PFI/PPP/P3 projects in construction. However, the grid is a summary that does not include every rating consideration. The weights shown for each factor in the grid represent an approximation of their typical importance for rating decisions but the actual importance may vary substantially. As a result, the grid-indicated rating is not expected to match the actual rating of each PFI/PPP/P3 project in construction. The grid will be available to market participants on a Moody's website upon signing a license agreement.

The grid contains five factors and two notching adjustments that are important in our rating assessment of PFI/PPP/P3 projects:

Five Factors:

1. Allocation of construction risks between the private sector and the public sector
2. Project construction complexity
3. Constructor/consortium experience and project readiness
4. Resilience of constructor to cost overruns
5. Resilience of project to construction schedule overrun

All of these factors except the first factor encompass a number of sub-factors.

Notching Adjustments:

1. Ease of replacement of constructor
2. Amount and quality of security available to replace the constructor or mitigate losses arising from a termination payment

This rating methodology is not intended to be an exhaustive discussion of all factors that our analysts consider in assigning ratings in this sector. We note that our analysis for ratings in this sector covers factors that are common across all project finance, such as ownership, management, corporate legal structure, governance, and country related risks, which are not explained in detail in this document as well as factors that can be meaningful on a company-specific basis. Our ratings consider these and other qualitative considerations and factors that do not lend themselves to a transparent presentation in a grid format. The grid used for this rating methodology reflects a decision to favor a relatively simple and transparent presentation rather than a more complex grid that would map grid-indicated ratings more closely to actual ratings. This is especially true in a PFI/PPP/P3 project where, around a very well established framework and contractual structure, there can be myriad specific aspects to the project being rated that do not fall neatly within the typical framework.

Highlights of this report include:

» An overview of the rated universe and a review of conditions that may lead to debt default events and potential losses to lenders in a PFI/PPP/P3 project being built
» A summary of the rating methodology
» A description of the key factors that drive rating quality
» Comments on the grid assumptions and limitations, including a discussion of rating considerations that are not included in the grid.

Appendix A shows the full grid.

For research publications that reference Credit Ratings, please see the ratings tab on the issuer/entity page on www.moodys.com for the most updated Credit Rating Action information and rating history.

This methodology describes the analytical framework used in determining credit ratings. In some instances our analysis is also guided by additional publications which describe our approach for analytical considerations that are not specific to any single sector. Example of such considerations include but are not limited to: the relative ranking of different classes of debt and hybrid securities, how sovereign credit quality affects non-sovereign issuers, and the assessment of credit support from other entities. Documents that describe our approach to such cross-sector methodological considerations can be found here.

About the Rated Universe Covered by this Methodology

PFI/PPP/P3 structures are designed to shift to the private sector certain financing, design, construction and operating[1] [2] risks of public infrastructure projects such as, but not limited to, hospitals, courthouses, schools, jails, roads, public transit systems, bridges and even power projects. Private sector consortia are engaged through a bidding process to design, build and operate infrastructure projects under long-term Project Agreements from a sponsoring government or one of its agencies. Once the asset is built to the specifications required by the sponsoring government, the sponsoring government will pay the private sector an *availability* payment that is sized to cover operating, maintenance, life cycle costs as well as debt service and equity returns. These availability payments are not subject to any material demand risk and are only adjusted for lack of performance or availability.

PFI/PPP/P3 projects are distinguished from traditional government procurement arrangements by the fact that they feature fixed-price, date-certain construction contracts and a payment for that asset made upon certain milestones being met, or through availability payments over a long period of time (generally 25 years or more) instead of as work progresses.

A typical PFI/PPP/P3 issuer (Issuer) is a limited purpose entity established to construct and then operate a public infrastructure asset pursuant to a long term Project Agreement with a sponsoring government or agency. The Issuer passes down substantially all the design and construction requirements under the Project Agreement to a constructor on a back-to-back basis under a fixed-price date-certain contract. Usually, the Issuer has no title to the infrastructure asset once the asset is built and its main asset is the long term Project Agreement which is assigned, along with all major other contracts, to the Issuer's lenders.

PFI/PPP/P3 projects are usually financed with very high levels of debt (often 90% or higher), with the equity level sized to produce a target debt service coverage ratio falling within a very narrow band (typically 1.15x to 1.30x) once the asset is built and starts receiving revenues.

In most cases, the Project Agreement sets a target date for substantial completion with substantial completion triggering the start of the availability payments. To meet the definition of substantial completion, the asset has to be able to show that it was built according to the specifications in the Project Agreement (e.g. a 350 room hospital with 6 operating theatres) and that it can perform according to the specifications in that same agreement (e.g. reliable supply of water, power, heat, medical gases, back-up systems, and air flow all at the required levels of quantity and quality). The Project Agreement also sets a long stop date for the completion of the construction so that if the project is not completed by that date, it's an event of default under the Project Agreement that gives the right to the sponsoring government to terminate the Project Agreement.

[1] Operating requirements are normally limited to operating the asset itself; for instance, in a school PFI/PPP/P3 project, the private sector will likely be responsible for operating and maintaining the systems that provide power, water, heating; will likely clean and maintain the buildings; will likely replace and repair what needs to be replaced or repaired. However, the education responsibilities will likely be retained by the sponsoring government.

[2] Some PFI/PPP/P3 projects do not have any operating period: see section "Other Rating Considerations" for the analysis of such projects

The construction period budget is sized to cover construction costs, interest during construction[3], Issuer SPV costs, reserve funding and miscellaneous costs such as insurance costs up to and including the target date for substantial completion.

Upon the termination of the Project Agreement before its scheduled maturity, the sponsoring government will make a termination payment, the calculation of which depends on the circumstances of the termination. Normally, senior debt is made whole in case of termination for sponsoring government's default (subject to the sponsoring government credit risk), convenience and force majeure, but will likely suffer losses if the termination is caused by the Issuer's default.

The principal risks to the Issuer's debt-holders during construction of a PFI/PPP/P3 project include the following scenarios:

a) the project is delayed beyond the original target date for substantial completion and the issuer runs out of liquidity to meet all its obligations before it is entitled to receive the availability payments;

b) the project cannot be completed before the long stop date in the Project Agreement, leading to a potential right of the sponsoring government to terminate the Project Agreement and pay a termination amount that may not cover senior debt, since that calculation will reflect a cost to complete penalty (as well as other costs, including potential additional costs related to the operating period);

c) the constructor[4] to which the construction obligations have been passed down needs to be replaced for a variety of reasons. These could include the constructor's inability to perform and deliver the asset in accordance with the required standards in the Project Agreement; its bankruptcy or insolvency, including as a result of losses incurred on the project being built; or its inability to complete the project by the constructor's long stop date. In all likelihood, such a replacement would entail a higher construction cost. If there are insufficient funds in the structure to cover these additional costs or if the failed constructor cannot be replaced, the Project Agreement may be terminated and the termination payment may be insufficient to reimburse the Issuer's debt.

This methodology may be applicable to any infrastructure project contracted by a government entity where the fundamental structure exhibits many of the same traits as a typical PFI/PPP/P3 project (for instance a design-build-finance project where the government will make milestone payments or a completion payment, where the risk allocation is similar to the one that is expected in a PFI/PPP/P3 project and where there are termination payments with such termination payment essentially only exposed to a cost to complete penalty).

However, this methodology is not designed to apply to projects that deviate materially from an availability payment PFI/PPP/P3 project model *even* when there is a fixed-price date-certain construction contract involved. While this methodology's framework can be used to analyze construction risk in a non PFI/PPP/P3 project and thus provide useful insight as to the construction period risk of that project, the methodology is not written and the scoring grid is not calibrated to accommodate non PFI/PPP/P3 projects that may exhibit some of the following characteristics: projects contracted by non-government entities; projects where the economic rationale can change significantly over time resulting in different behaviours by the Issuer's consortium; projects that are exposed to volume and/or price risk (for instance, such that in case of termination of the project agreement/concession during construction, the termination payment or the sale price may reflect changes in post construction revenue assumptions, not just cost to complete considerations); projects with no termination payments for force majeure and for convenience so more exposed to a wider range of construction risks and economic rationale risk; projects fully exposed to the whole suite of construction risks such as land acquisition, long lead time permits, etc.

[3] Amortization of debt principal is typically scheduled to start shortly after the target date for substantial completion.

[4] In this document we use the term "constructor" to cover both projects built by a single construction company and those built by construction joint ventures which include two or more construction companies/equipment suppliers

Since 1997, Moody's has rated more than 80 PFI/PPP/P3 projects. There has not been any default observed on any of these projects although delays in achieving completion are not uncommon. Projects that are not overly complex and that benefit from solid and experienced constructors as well as solid liquidity and security can achieve investment grade ratings.

About this Rating Methodology

This report explains the rating methodology for PFI/PPP/P3 in construction in six sections, which are summarized as follows:

1. Identification and Discussion of the Grid Factors

The grid in this rating methodology focuses on five factors and two notching adjustments[5]. Certain broad factors are comprised of sub-factors that provide further details. The three most important factors in the scorecard are project complexity, experience of the project consortium and resilience to schedule overrun. These factors, equally weighted in the scorecard at 25%, are the most heavily weighted of the factors because, in Moody's experience, these are factors most determinative of a project's likelihood of encountering problems that could lead to material stress during construction and of the ability of the Issuer to mitigate those problems when incurred. Project complexity represents the intrinsic construction risk of the project that can lead to delays and cost overruns; consortium experience and project readiness represents the ability of the consortium to deal with the project complexity and thus minimize schedule delays and cost overruns; while resilience to schedule overrun is based on Moody's observations that project schedule overruns are not unusual for PFI/PPP/P3's.

TABLE 2

Grid Factors , Sub-Factors and Notching Adjustments for PFI/PPP/P3 Projects in Construction

BROAD RATING FACTORS, SUB-FACTORS & NOTCHING ADJUSTMENTS	WEIGHT
Factor 1: Construction risk allocation between the private sector and the public sector	5%
Factor 2: Project construction complexity	25%
» Site preparation requirements & substructure risk	
» Structure complexity and construction technique risk	15%
» Performance risk	
» Construction constraints risk	10%
Factor 3: Constructor/Consortium experience and project readiness	25%
» Constructor/consortium experience	15%
» Project readiness & risk management	10%
Factor 4: Resilience of constructor to cost overruns	20%
» Profit margin & contingency & robustness of budget build-up	10%
» Strength of the constructor and relative size of the project	10%
Factor 5: Resilience of project to construction schedule overrun	25%
» Construction schedule room	10%
» Liquidity to withstand a schedule overrun	15%
Total	100%
Notching Adjustments :	Notching
» Ease of replacement of the constructor	+1 to -2
» Amount and quality of security available to replace the constructor or mitigate losses	+2.5 to 0

[5] Notching adjustments are by no means the only reason that actual ratings will differ from the grid-indicated rating suggested by the five factors. Please see "Other Rating Considerations" for more commentary.

2. Measurement or Estimation of Factors in the Grid

We explain our general approach for scoring each grid factor and notching adjustment and show the grid factor weights used in the grid. We also provide a rationale for why each of these grid components is meaningful as a credit indicator. The information used in assessing factors and sub-factors is generally found in:

- The Project Agreement
- The design-build contract with the constructor
- The independent engineer review of the project construction risks
- The financial model
- The independent insurance advisor report
- The equity commitment and support documents
- The debt terms and conditions
- Site visits (if possible) and discussions with the equity sponsor, the constructor and the independent engineer

3. Mapping Grid Factors to the Rating Categories

After estimating or calculating each sub-factor, the outcomes for each of the sub-factors are mapped to a broad Moody's rating category (Aa, A, Baa, Ba, B, or Caa). Since construction risk is intrinsically a risky activity, the grid criteria do not provide for Aaa factor scoring.

4. Assumptions and Limitations and Rating Considerations not Included in the Grid

This section, which follows the detailed description of each factor, discusses limitations in the use of the grid to map against actual ratings, some of the additional factors that are not included in the grid that can be important in determining ratings, and limitations and key assumptions that pertain to the overall rating methodology.

5. Determining the Overall Grid-Indicated Rating

To determine the overall grid-indicated rating, we convert each of the sub-factor ratings into a numeric value based upon the scale below.

Aaa	Aa	A	Baa	Ba	B	Caa	Ca
1	3	6	9	12	15	18	20

The numerical score for each sub-factor is multiplied by the weight for that sub-factor with the results then summed to produce a composite weighted-factor score. The composite weighted-factor score is then mapped back to an alphanumeric rating based on the ranges in the table below.

Grid Indicated Rating

Grid-Indicated Rating	Aggregate Weighted Total Factor Score
Aaa	x < 1.5
Aa1	1.5 ≤ x < 2.5
Aa2	2.5 ≤ x < 3.5
Aa3	3.5 ≤ x < 4.5
A1	4.5 ≤ x < 5.5
A2	5.5 ≤ x < 6.5
A3	6.5 ≤ x < 7.5
Baa1	7.5 ≤ x < 8.5
Baa2	8.5 ≤ x < 9.5
Baa3	9.5 ≤ x < 10.5
Ba1	10.5 ≤ x < 11.5
Ba2	11.5 ≤ x < 12.5
Ba3	12.5 ≤ x < 13.5
B1	13.5 ≤ x < 14.5
B2	14.5 ≤ x < 15.5
B3	15.5 ≤ x < 16.5
Caa1	16.5 ≤ x < 17.5
Caa2	17.5 ≤ x < 18.5
Caa3	18.5 ≤ x < 19.5
Ca	x ≥ 19.5

For example, an issuer with a composite weighted factor score of 11.7 would have a Ba2 grid-indicated rating. We used a similar procedure to derive the grid indicated ratings shown in the illustrative examples in this document.

6. Appendix

Appendix A summarizes the factor, sub-factor and notching adjustment grid.

Discussion of the Grid Factors & Notching Adjustments

The grid for PFI/PPP/P3's in construction focuses on five broad factors and two notching adjustments:

Factors:

1. Allocation of construction risks between the private sector and the public sector
2. Project construction complexity
3. Constructor/consortium experience and project readiness
4. Resilience of constructor to cost overruns
5. Resilience of project to construction schedule overrun

Notching Adjustments:

1. Ease of replacement of constructor
2. Amount and quality of security available to replace the constructor or mitigate losses arising from a termination payment

Factor 1: Allocation of Construction Risks between the Private Sector and the Public Sector (5% weight)

Why it Matters

A PFI/PPP/P3 project starts with a negotiated allocation of the construction risks between the sponsoring government and the private sector. Very few PFI/PPP/P3's allocate all the construction risks to either party. When the sponsoring government agrees to keep or share some of the construction risks, that can take either of two forms: either through a *delay event* (that provides time relief to the private sector to complete the construction of the asset) and/or a *compensation event* (that compensates the private sector for costs arising from the incurrence of such risks). The most supportive risk allocations from a credit point of view are those where the allocation of construction risks is clear; the allocation is generally standard for the jurisdiction hence well understood and tested; the sponsoring government keeps the risks that cannot be easily controlled/priced by the private sector (such as land acquisition) and provides both for schedule relief and timely compensation for those risks.

How we Assess it for the Grid

Broadly speaking, the following outlines a typical risk allocation for a PFI/PPP/P3[6] project:

TABLE 3

Typical Construction Risk Allocation in a PFI/PPP/P3 Project

Risks usually kept by the private sector	Risks usually kept by the public sector (either delay event or compensation event)	Shared risks or case by case allocation
All matters related to design, construction, getting appropriate resources, suppliers, materials and equipment; input price risk		
Weather		
Geotechnical conditions		
Protected/endangered species, habitat compensation		
Utilities relocation		Sometimes the risk sharing is as follows: utilities identified in the Project Agreement are private sector risk while undisclosed ones are public sector risk
	Land and right of way acquisition within an agreed upon area	
	Archeological/historical finds	
	Change orders requested by the sponsoring government	
	Force Majeure	
	Asset replacement cost beyond insurance coverage	
Construction permits	Initial planning/regulatory/long lead time permits	
Specific company strikes	General construction industry strikes	
Disclosed/known contamination	Undisclosed/unknown contamination and /or contamination beyond an agreed upon level	
		Change in Law (post bid) can be either party's risk or a shared risk
		Blockade/protests could be either party's risk or a shared risk

Any material deviation (positive or negative) from this broad risk allocation will be assessed on its own merits in order to determine the potential impact on the rating of the Issuer. For instance, in some projects, the private sector retains archeological risk. Given the general difficulty of locating archeological and historical artifacts before construction starts, such a shift of risk to the private sector could be a concern unless the project takes place in an area where finding such artifacts is highly unlikely or where the impact is probably very limited (e.g. artificially created land, brownfield site or project with a small footprint). Conversely, in some cases, the sponsoring government agrees to retain or share geological risk or some other risks normally kept by the private sector. Again, the extent, materiality and timeliness of such risk sharing will help determine whether it reduces the risk sufficiently for the private sector to improve the scoring of this factor.

[6] This is a very high level risk allocation; actual documents will be more nuanced: for instance while contamination that is not disclosed in the Project Agreement is usually government risk, contamination caused by the private sector is usually private sector risk

Another aspect of this factor is the overall assessment of the Project Agreement's terms and conditions (dispute procedure, process for reviewing and signing off drawings, etc)[7]. While in major OECD jurisdictions the PFI/PPP/P3 contracts typically follow a similar overall framework, there can be some significant variations.

	Weight	Aa	A	Baa	Ba	B/Caa
Construction risk allocation	5%	The sponsoring government retains most of the construction risks through delay and compensation events; timely compensation; highly supportive contract terms and conditions	The sponsoring government retains some material construction risks that are usually borne by the private sector with appropriate time relief and compensation; timely compensation; supportive contract terms and conditions	The sponsoring government and private sector have a standard risk allocation; For the risks retained by the sponsoring government, appropriate levels of time relief and compensation; standard overall PFI/PPP/P3 terms and conditions	The private sector retains more construction risks than in a standard allocation of risks and these risks can be material; or thresholds for time relief and compensation are high or the risk allocation is somewhat unclear; overall contract terms and conditions have some areas of concern	The private sector retains most construction risks with very little allocated to the sponsoring government; unusual terms and conditions of the Project Agreement that lead to material specific concerns

Factor 2: Project Construction Complexity (25% weight)

Why it Matters

The PFI/PPP/P3 framework is used to procure a wide range of assets in terms of construction complexity: from simple low rise accommodation buildings to highly complex transportation projects. As complexity rises, so does the *uncertainty* as to the final cost and the schedule to complete the construction of the asset. While the Issuer has entered into a fixed-price date-certain contract with a constructor, under this factor we assess the likelihood that construction complexity could result in schedule overruns or create operational or financial stress for the constructor that could lead to the necessity of replacing it at a higher cost if that constructor cannot perform or finish the project on time.

In this factor, we examine and assess the four main sub-factors of a PFI/PPP/P3 project construction complexity:

i) site preparation requirements & substructure risk

ii) structure complexity and construction technique risk

iii) performance risk

iv) construction constraints risk

[7] The actual assessment of the performance requirements to be met by the asset is addressed in the next section "Project Construction Complexity" and does not fall under this factor.

The first three sub-factors (i, ii and iii) have a total weight of 15% and the last sub-factor (iv) has a weight of 10%. We have not allocated distinct weights to the first three sub-factors to recognize that the PFI/PPP/P3 model may apply to a wide range of assets some of which may not exhibit all the construction phases that we have assumed in a standard project. We assess each of the first three sub-factors separately by applying the grid indicated below and the specifics of the project will dictate the weight each of these sub-factors may warrant for a total combined weight of 15%.

For instance, a building project will likely have even-weighted sub-factors i), ii) and iii) given that a building generally requires at least some kind of site preparation and sub-structure, an envelope and mechanical and electrical components. A computer system project on the other hand would likely have the whole 15% weight allocated to factor iii) "performance risk". An accommodation refurbishment project may not have any "site preparation requirement & substructure risk" so that the 15% overall weight between sub-factors i), ii) and iii) would be allocated to "structure complexity and construction technique risk" and to "performance risk".

When scoring "Project Construction Complexity" for projects composed of various elements with widely different degrees of complexity (for instance a project composed of a simple road and a large bridge or a complex interchange; a project composed of a large hospital building and a separate simple administrative building), the scoring of the sub-factors would typically mostly reflect the complexity of the most difficult component as that component would probably be on the critical path and be more likely to result in schedule and cost overruns.

i) Site Preparation Requirements & Substructure Risk

Why it Matters

Most infrastructure projects require at least some level of site preparation/substructure work before construction of the actual asset (be it a building, a road or a rail transit system) can commence. Since it is impossible to know with absolute certainty what lies below the surface of the site before the project starts, it's not unusual for projects to incur delays and unexpected costs as a result of geological or other site conditions being different than expected. Actual conditions can translate into excavation delays or a requirement for more surcharge pre-loading to achieve the required soil settlement qualities or additional deep foundations (e.g. piling), a need for more waterproofing of the site, or lengthier or more expensive utility relocation than anticipated. The resulting schedule delays and or cost overrun can be material. However, these issues typically occur at the beginning of the project construction, when the full project schedule and the entire cost contingency are usually available.

How we Assess it for the Grid

In this sub-factor, we assess the complexity of whatever site preparation or sub-structure work is needed before construction of the main asset structure can commence in view of the construction site characteristics such as its size and its geological complexity. The scope of activities assessed in this sub-factor will depend on the type of project. With respect to the geological conditions, we will assess the level of complexity of the site geology[8] and the level and quality of the information[9] that is available in order to assess that risk (acknowledging that in most if not all PFI/PPP/P3 projects there is a minimum of knowledge available from the sponsoring government's studies). Site size is also important to assess as the more extensive the area the more difficult it is to understand the full geological risk of the construction site. With respect to site preparation, we assess the extent to which the following may be needed to prepare the site before the actual construction is commenced: utilities relocation, removal and treatment of contaminated soils, blasting, excavating, tunneling, waterproofing, surcharge pre-loading, shoring or similar type of work.

[8] Complexity refers both to the suitability of the geological conditions for the project (for instance a solid rock layer to anchor a building versus a very soft terrain that will require deep foundations) and to the uniformity of the geological conditions through the site (for instance a uniform sandy site with a rock layer at a constant depth versus a highly complex combination of different soil types and depths through the site).

[9] The lenders' technical advisor report typically provides an assessment of the quality of the geological information and its reliability, including a commentary on the quality and the extensiveness of the geological tests.

With respect to sub-structure risk, we assess the extent to which deep foundations such as piling may be required.

For example, a building built in a remediated brownfield area with no need to excavate (i.e. shallow foundation), or move utilities, and no need for surcharge pre-loading may be scored Aa-A. By contrast, a civil infrastructure project that requires a multitude of bridges with piling in a river, tunnels with an expectation of very complex geology requiring different techniques and complex machinery (e.g. a tunnel boring machine) and relocation of a multitude of utilities would likely score B or Caa.

	Aa	A	Baa	Ba	B	Caa
Site preparation/ sub-structure risk	Well understood and simple geology; very limited site area; very limited scope and complexity of construction site preparation and very limited need to build substructures, all well within known and simple technologies	Well understood and primarily simple geology; limited site area; limited scope and complexity of construction site preparation; limited need for substructures, all within known and essentially simple technologies	Well understood and moderately complicated geology; manageable/ standard site area; site preparation requirements that do not entail very lengthy processes or blasting or tunneling; normal substructures (but excluding material/ extensive deep foundations), all within standard technologies	Well understood and somewhat more complicated geology; fairly extensive site; some aspects of the project have complex or lengthy site preparation requirements such as some limited blasting, cut and cover tunnels or surcharge pre-loading requirements and some substructures may be complex but usually all within accepted techniques	Complex geology; extensive site; complex , extensive, lengthy site preparation requirements that may require extensive blasting; complex/extensive substructures; some unusual or complex techniques required	Unusual/difficult geology; very extensive site; the project is unique, few precedents with that combination and extent of site preparation risks and substructure risk; unique techniques or equipment required (such as a tunnel boring machine)

ii) Structure[10] Complexity & Construction Technique Risk

Why it Matters

PFI/PPP/P3 projects also range widely in complexity of structure once the site preparation work has been completed. As structures increase in uniqueness as to design, construction techniques and complexity, the higher the risk for schedule and cost creep.

How we Assess it for the Grid

Under this factor we assess the broad range of risks associated with the complexity of the asset structure, the construction techniques used, and the materials used.

With respect to the complexity of the asset, we assess whether the structure being built has many precedents or is quite unique (due to height, length, size, type, architecture, etc), whether the construction is highly repetitive (e.g. an office tower with every single floor except the mechanical floor being built exactly with the same floor plan) versus composed of mostly unique elements, each requiring a highly specific design. With respect to construction techniques, we assess the extent to which design and construction techniques used are routine, specialized or unique (for instance: a new or seldom tested way of building a bridge); whether a material portion of the work can be done offsite and assembled onsite (e.g. prefabricated buildings) or whether everything needs to be done on site, and whether the project can be broken down into several independent elements that can be worked on in parallel (e.g. a school project with multiple sites and thus multiple construction teams, so that if one site is late and others are ahead,

[10] The separation between substructure and structure is somewhat artificial; Sub-structure is meant to cover everything that is needed to anchor the asset in the ground; Structure would be anything above that. So in a building, deep foundations such as piling would be assessed under factor 2 i) and then everything starting at basement level would be part of the structure and assessed in sub-factor 2ii); for a road in a tunnel, tunneling risk would be assessed in 2i) whereas building the actual road would be assessed in 2ii).

resources can be re-allocated to the delayed part of the project) or whether the project is sequential (greatly increasing the likelihood that a delay in any element may delay the entire project). With respect to materials, we assess whether materials used are widely available, well proven and normal for that type of project or whether new materials may be used.

An additional consideration is whether the project is a refurbishment versus a new build. While refurbishment may be easier and thus may typically score higher than new build since it is usually limited to upgrades or cosmetic work as opposed to rebuilding the whole structure, some risks can be hidden or not known until well after the work has started. For instance, it may not be feasible to determine the whole extent of a bridge deck deterioration until all the deck surface has been removed. Similarly, when refurbishing involves a large number of units (e.g. housing), the survey of pre-existing conditions is usually sampled-based, thus creating a risk that the sample may not be representative of the work to be done. Hence the scoring of this sub-factor for refurbishment projects will depend not only on the intrinsic complexity of the structure but also the extent to which the full and exact asset condition can be assessed prior to the start of construction.

For example, projects where several low rise schools need to be built on different sites and all use highly repetitive simple floor plans typical of the jurisdiction in which the school is being built, using standard techniques and materials may be scored Aa or A. Conversely, a large bridge would likely score towards the lower range of the grid, since each bridge typically has its own specific design conducted by specialized firms, usually requiring specialized calculations and tests (resistance to wind, vibrations, ship impact, scouring, earthquake event, etc).

	Aa	A	Baa	Ba	B	Caa
Structure complexity & construction technique risk	Very simple structure; highly repetitive; very well tested and very simple design and construction techniques; material offsite work; several independent elements; very well known and highly appropriate materials for the project	Simple structure with a material level of repetitiveness; simple normal design and construction techniques; some offsite work possible on some elements of the project; some material ability to work independently on various aspects of the project; generally well known and appropriate materials	Structure of standard complexity; well understood design and construction techniques although they could have a certain element of complexity; some repetitive elements within at least a material part of the project; may have a few complex elements for the more unique parts of the project (e.g. mechanical floor in a hospital) but well within industry norms and experience; project is mostly sequential and has limited offsite work; materials generally appropriate for the project	Some complex structural elements; may require material testing to demonstrate that the asset can withstand a range of events (wind, etc); minimal repetition; some complex or unusual design and construction techniques; project is essentially sequential with minor offsite work; may incorporate less well tested materials in some parts of the project	Several complex, unique elements of the structure; extensive testing to demonstrate that the asset can withstand a wide range of events (wind, etc); complex and/or unusual design and construction techniques; project structure is highly sequential and is all essentially built on site; materials used may be unusual or untested for a material portion of the project	Many complex, unique elements in the design, structure, techniques and materials that, singly or in combination, cause a very high degree of construction risk

iii) Performance Risk

Why it Matters

Many infrastructure projects exhibit sizeable mechanical, electric, IT, systems and equipment[11] work that involves lengthy installation, testing and commissioning in order to ensure that the asset meets all the minimum availability and performance requirements outlined in the Project Agreement. Often, once substantial completion has been reached, there are still transitioning and fine-tuning issues with respect to such equipment until a steady operating state is reached. With the increased complexity of the equipment and systems being used in infrastructure assets, risks to the schedule and to the construction cost can arise during commissioning if the equipment does not perform as expected and needs to be fine tuned, repaired, replaced and re-tested until all the performance and availability requirements can be met in order to meet the definition of substantial completion.

How we Assess it for the Grid

Under this sub-factor, we assess the extent, range and complexity of the asset's electric and mechanical, systems, IT and equipment that need to be installed in the project. We also assess the sponsoring government's minimum performance and availability standards as set out in the Project Agreement that need to be met in order to reach substantial completion. Examples of these standards include parameters for air quality and air flow quantity, temperature, light intensity, noise insulation, safety, reliability, road geometry standards such as slope and roughness, etc. We also assess the length of the commissioning period required to ensure that the equipment is working at the expected level of performance as, generally, the length of the commissioning period is a good indicator of complexity.

For example, a simple road required to follow well-known industry standards (e.g. American Association of State Highway and Transportation Officials) and with normal lighting and other system requirements would likely score A or Aa. In the middle of the spectrum, a hospital typically requires medical gas, specific control of air flows and air quality, complex electrical systems with emergency back-up, all of which may represent a significant portion of the total construction budget. Scoring of Baa or Ba is thus likely as the services and standards are relatively stringent but also generally well known and typical for hospitals. By contrast, a highly specialized research facility with very stringent requirements by the sponsoring government that are unique and specific, for instance relating to precise insulation of air flows, specialized security systems, or performance requirements that fall within extremely narrow bands (e.g. temperatures levels, noise levels, vibration levels) may score towards the lower range of the grid.

[11] The list of equipment is not exhaustive: boilers, chillers, generators, turbines, elevators, computers, cameras, alarm systems, security systems, tolling systems, electrical systems, etc.

	Aa	A	Baa	Ba	B	Caa
Performance risk	Few very simple mechanical and electrical (M&E) systems, IT and equipment need to be installed –all well proven technology; these components of the project are a small percentage of construction budget (typically less than 5-10%); availability & performance standards to reach substantial completion are limited in scope and highly achievable; very short commissioning period (<2 months)	Simple M&E systems, IT and equipment need to be installed –all proven technology; these components of the project are a relatively small percentage of construction budget (typically 10-20%); availability & performance standards to reach substantial completion are relatively limited in scope and can be easily achieved; short commissioning period (<3-4 months)	M&E systems, IT and equipment required are standard for the asset although they can have a certain degree of complexity –generally proven technology; these components represent a material percentage of the construction budget (20-35%); Availability & performance standards to reach substantial completion follow industry norms and may have some degree of stringency; moderate commissioning period of 4-6 months	M&E systems, IT and equipment required are relatively extensive and complex- some elements may not be well proven; these components represent a large proportion of the construction budget (35% -55%); several strict standards with respect to performance and availability to reach substantial completion, some of which may be above industry norms; relatively lengthy commissioning period of 6-9 months	M&E systems, IT and equipment required are extensive and complex- several elements may not be proven (i.e. custom made); these components represent a very substantial portion of the construction budget (55-75%); very high standards of performance and availability in most of the facility to reach substantial completion, several of which may be above industry norms or may be unusual; lengthy commissioning period of 9-12 months	M&E systems, IT and equipment required are extensive and unique; mostly a custom order M&E, IT or equipment project; extremely high and unique performance and availability standards; extensive commissioning period (>1 year)

iv) Construction Constraints Risk (10% weight)

Why it Matters

Constraints in construction projects can vary widely and can introduce risks that lead to material cost overruns or schedule delays. Most are well known normal constraints and apply to all construction projects as a matter of course (e.g. respect of safety and labour laws) but others are project specific. Some are imposed through the Project Agreement (e.g. maintaining a minimum number of lanes open for circulation while a road is being expanded or making it expensive to shut down lanes at certain times of the day; maintaining a train station open while the building is being modernized; maximum vibration or noise levels during the construction period when the construction takes place near a sensitive area; or a multitude of parties whose approval is required or who need to be consulted). Other constraints are a result of laws and regulations that are pertinent to the project (environmental, endangered species, minority populations, etc). A fourth set of constraints results from the site location such as a congested site, or a site requiring water works. For instance, constrained access could create a need to stage the phases of the project (i.e. build a portion of the project first -or even build temporary facilities first-, move the operations of the existing facilities to the new facilities, demolish the old facilities and then complete the project).

How we Assess it for the Grid

In this sub-factor, we assess the number and magnitude of the project specific constraints, the ease with which they can be worked around and also the potential impact on the critical path if certain important timing windows are missed (e.g. having to do all foundation work for a bridge in water outside of the fish spawning season; or needing to complete a critical structure before winter sets in and disrupts supply lines and or construction operations until spring).

For example, a military housing project being built in a rural area with no particular constraint as to access, endangered species, noise, dust, vibration limits and where construction can occur all year round with a normal work week may score A or Aa. By contrast, an extensive road project crossing multiple municipalities in a very dense urban area where the existing roads must remain open, where the contracting authority puts a number of limits on accessing certain portions of the highway (e.g. only at night) and/or where various

limits on vibration, dust, or noise levels are quite stringent or onerous to meet would likely score towards the low end of the grid.

	Weight	Aa	A	Baa	Ba	B	Caa
Construction constraints	10%	No material constraints beyond constraints generally applicable to the industry (e.g. vacations, weather; widely known construction laws and regulations); no constraint that could impact the critical path	A few manageable constraints, not expected to result in requirements for material work around; restrictions set at very workable levels; only impacts a limited period of the project construction; no material constraints that could impact the critical path	A few manageable constraints with some well understood and relatively simple work around requirements; restrictions set at workable levels; constraints affect only a reasonably limited period of the project; limited impact on critical path	Several constraints and restriction levels are such that material workaround is required but the workaround solutions have precedents and a reasonable degree of predictable results; if workaround cannot be implemented, it could have a material impact on the critical path; restrictions affect several phases of the project.	Many constraints or unusual constraints; restriction levels that are restraining or have limited precedents for workarounds; high risk of material impact on critical path if work cannot be done efficiently and in a timely basis as a result of all the constraints; restrictions are pervasive through the whole length of the project	The project as a whole is subject to a multitude of constraints affecting most of the construction period; restrictions set at tight levels; highly unusual workaround solutions; impact on critical path could be extremely deleterious if work cannot proceed as a result of the constraints

Factor 3: Constructor/Consortium Experience & Project Readiness (25% weight)

Why it Matters

The experience of the constructor/consortium and its approach to the project are crucial determinants in the difference between a successful project and a problematic one.

i) Constructor/Consortium Experience (15% weight)

Why it Matters

Since most construction projects tend to run into some difficulties at some point or other of their life, whether the problems escalate into a failed project or whether the project can be put back on the right track depends in large part on the experience of the parties involved. Significant aspects include their experience with the specific type and size of project, with the jurisdiction where the project is located and with PFI/PPP/P3's (since PFI/PPP/P3 construction projects need to be managed differently from traditionally procured assets).

How we Assess it for the Grid

Under this factor, we assess the constructor[12] and more broadly the consortium's experience and track record in these three areas (jurisdiction, type and size of asset, PFI/PPP/P3[13]). This assessment may include getting a sense of the experience of the key constructor personnel who will lead the project construction and of the personnel from the project company/equity sponsor who will oversee the project. The equity sponsor's experience with PFI/PPP/P3 project oversight is crucial to ensure close monitoring of the construction period, requiring remediation plans from the constructor when delays start appearing, ensuring that the constructor meets its obligations (including enforcing all its rights against the constructor when

[12] Constructor being the actual party to the construction contract and its guarantor if applicable.

[13] Experience with PFI/PPP/P3 projects or, at a minimum, similar types of construction projects where the constructor undertakes to build a project on a fixed-price date-certain contract.

appropriate) and helping to manage all key relationships, including with the sponsoring government. We also assess whether the members of the consortium have a good track record of working together.

	Weight	Aa	A	Baa	Ba	B	Caa
Constructor/ consortium experience	15%	Extensive successful track record in jurisdiction, with type and size of project, and with PFI/PPP/P3's; very robust oversight and project management; consortium members have excellent track record of working together	Good track record in jurisdiction with type and size of project, and with PFI/PPP/P3's; robust oversight and project management; consortium members have good track record of working together	Good track record in two out of the three areas (PFI/PPP/P3, project type/size, country); adequate oversight and project management; consortium members have limited but successful track record of working together	Good track record in one out of three areas of experience (PFI/PPP/P3, project type/size, country); potentially weak project management and oversight; consortium members have limited track record of working together	Limited track record in all 3 areas (PFI/PPP/P3, project type/size, country); weak project management and project oversight; consortium members have no track record of working together	Questionable track record in all respects; inexperienced project management and/or ineffective project oversight; Note that in that case, a high degree of focus needs to be put on a constructor replacement scenario and/or a Project Agreement termination event

ii) Project Readiness & Risk Management (10% weight)

Why it Matters

Since PFI/PPP/P3's involve a bidding situation between various consortia, each consortium attempts to find an acceptable balance between reducing construction risks if it wins the contract and minimizing bid costs in case it does not win. Hence consortia exhibit different risk mitigation strategies for their bid depending on their risk tolerance, and other factors[14]. Risk mitigation strategies at bid phase and pre-financial close may include: increasing the percentage of the project design that is fully developed; building and testing mock up rooms; ordering additional geotechnical studies or other studies over what is made available by the sponsoring government; getting pre-clearance by utilities, municipalities or other governments with respect to certain aspects of the project (e.g. use of a municipal park or other land as a staging area if the project is in a constrained space); identification of key sub-contractors who have quoted prices based on reviews of the available designs; pre-negotiation of major sub-contracts ready to be signed at financial close; close coordination between the constructor and the provider of the operating and maintenance services starting in the design phase.

Another area that can potentially lead to risk during the construction period relates to the management of sub-contractors and key suppliers by the constructor. Very few constructors self-perform an entire project and they typically will pass down some or most of their obligations to a range of sub-contractors and suppliers who may be substantially smaller and financially weaker than the constructor. And yet, some of these sub-contractors/suppliers may be critical to the success of the project, such as suppliers of large and specialized equipment (rail cars, large mechanical and electrical equipment, pre-fabricated modules...etc) and may not be easily replaceable in a timely fashion.

How we Assess it for the Grid

Under this sub-factor, we assess the constructor's approach to and management of the obligations it has accepted and risks it has taken on. We will also assess the constructor's approach to managing the sub-contractors/suppliers risk and the robustness of its supply chain management (SCM): exposure to sub-contractors and suppliers that cannot be easily replaced or can only be replaced with a long lead time; process for selection of sub-contractors/suppliers; experience and track record of major sub-contractors and

[14] For instance, construction companies can go through cycles of disciplined approach to projects, then, if faced with a difficult environment or higher competition or the need to enter a new market, they may relax their discipline; it is important to understand where a constructor may stand in that cycle.

key suppliers; quality control management; spreading of risks for large budget components; requirements for sub-contractors and suppliers to post security by way of letters of credit, performance bonds; constructor's sub-contract risk insurance[15]. A project where the majority of sub-contractors/suppliers need to post material security (or where there is material and reliable sub-contract risk insurance) will be viewed as stronger with respect to scoring this factor than one where there is no such security.

Constructors with self-perform capabilities may score higher with respect to the factors related to project readiness and budget-build up but may be more difficult to replace if they need to be terminated. Each situation will need to be assessed on its own merits in order to determine what the net effect is on the project when a company with a high percentage of self-perform is involved in a project.

	Weight	Aa	A	Baa	Ba	B	Caa
Project readiness & risk management	10%	Very conservative approach throughout; evidence of active and extensive risk reduction strategies employed throughout the project design and preparedness to mitigate the risks identified under factor 2[16]; high degree of confidence that such strategies will sufficiently mitigate the risks and will have predictable results; very limited risk exposure to material sub-contractors availability and credit risk through pre-identification, pre-clearance, material diversification and material security posted by such sub-contractors; well established and solid supply chain management (SCM)	Evidence of active and material risk reduction strategies employed throughout the project design and preparedness for all of the major risks identified under factor 2; good degree of confidence that such strategies will help mitigate such risks; limited exposure related to material sub-contractors availability and credit risk through pre-identification, pre-clearance, good diversification and material security posted by the material sub-contractors; good SCM	Normal, standard approach to bid/project and identified risks including close coordination with the facilities management provider during the design/construction period; partial mitigation of some risks or lower degree of comfort that the risk mitigation strategies will result in predictable outcomes; some larger identified critical sub-contractors but risk well mitigated through security; material percentage of the project may not have identified sub-contractors for smaller contracts but no concern with respect to availability of such sub-contractors at prices within budget; adequate SCM	A few aspects of the project approach/bid approach are exposed to risks that cannot be entirely mitigated or for which the de-risking strategies may not have a high degree of outcome predictability; potential risk associated with one or more critical sub-contractors and there are some gaps in the security being posted; high percentage of project may not have identified subs but no concern with respect to the availability of such subs; generally adequate SCM	Several large elements of the bid approach/ project are representing additional risk that cannot be mitigated; large critical sub-contractor risk with such key sub-contractor not easily replaceable without lengthy delays; limited security taken from critical sub-contractors; concerns with respect to the availability of sub-contractors; weak SCM	Very aggressive approach to risk throughout the project, bid and for the project approach; very little thought given to risk mitigation; high dependence on high risk key sub-contractors with no security being taken; high degree of concern with respect to the availability of sub-contractors; untested or very weak SCM

[15] In North America, typically purchased by the constructor to insure the performance of sub-contractors it has engaged as an alternative to requiring that sub-contractors provide their own bonding. When project-specific and with appropriate sub-limits, such insurance can help mitigate sub-contractor risk on the project.

[16] So for instance, if geological conditions are identified as a risk in factor 2, to score well in this sub-factor 3 ii) the constructor would need to demonstrate that it has undertaken additional geological studies, and/or selected design choices that take into account the potential uncertainty with respect to geological conditions, and/or settled on a schedule that provides adequate buffer to spend more time on site preparation and excavation/piling so that ultimately, geological risk is materially reduced.

Factor 4: Resilience of Constructor to Cost Overrun (Before Termination of Contract) (20% weight)

Why it Matters

Since it is not unusual for a construction project to incur a cost overrun beyond the base budget (thus forcing the constructor to dip into the construction budget contingency and possibly the constructor's profit margin), the resilience of the constructor to manage cost overruns is a key determinant of the success or failure of a PFI/PPP/P3 project. A resilient constructor generally has some ability to absorb that stress without defaulting on its obligation and/or becoming insolvent. Several PFI/PPP/P3 projects have cost more than the constructor had bid, but in most cases the constructor has nonetheless completed the project, as contractually required, as evidenced by the very good track record of PFI/PPP/P3 projects in the countries where we have rated PFI/PPP/P3 projects.

How We Assess it for the Grid

We primarily examine the following elements to assess the ability of the constructor to absorb cost overruns:

i) Profit Margin & Contingency & Robustness of Budget Build-up (10% weight)

The percentage profit margin and contingency[17] already incorporated in the fixed price contract act as a first level of cushion for the constructor to absorb some cost overruns. As well, the robustness with which the construction budget is built can help deal with or limit certain cost overrun types. For instance, a construction budget with specific escalation indices for labour, concrete, steel, asphalt etc, and realistic assumptions as to the future evolution of these indices is more robust than one built with a general CPI index, especially when the construction industry conditions are volatile in the jurisdiction of the project. In addition, a construction budget built with a very disciplined reconciliation of quantities (e.g. separate teams) and based on quoted committed unit prices/fixed prices from suppliers is again more robust than a budget based on loose estimates.

While profit margins and contingency levels can vary depending on the type of project, the risk allocation, the construction industry cycle, we would typically expect that a prudent constructor would incorporate in its bid price a level of contingency and profit margin appropriate for the level of risk it shoulders. Mid single digit profit and contingency percentages -or less than that- would be deemed "below average" except in the most simple projects and stable conditions. Average contingency and profit margins may range from high single digit to low mid teen percentages depending on project complexity whereas mid to high teen percentages would normally pertain only to the most complex projects.

The scoring will reflect not only the profit margin and contingency range but also the quality and comprehensiveness of the information available to make that assessment.

	Weight	Aa	A	Baa	Ba	B	Caa
Profit margin and contingency vs industry conditions	10%	Very strong profit margin and contingency characteristics given the type of project and industry conditions; highly disciplined budget build up methods with independent	Strong profit margin and contingency characteristics given the type of project and industry conditions; disciplined budget build up; robust escalation assumptions	Average profit margin and contingency characteristics given the type of project and industry conditions; adequate budget build up; adequate escalation	Below average profit margin and contingency characteristics given the type of project and industry conditions; somewhat weak budget build up; general CPI escalation	Below average profit margin and contingency characteristics given the type of project and industry conditions; weak budget build up; somewhat aggressive assumptions with	All other cases; including if there are strong concerns about overall industry construction conditions and constructors bidding at very thin margins, or at a loss, to win contracts

[17] The profit and contingency margin is measured as a % of the pre-profit and contingency construction budget. Often the profit margin is called the "profit and overhead margin". It is distinct from the escalation allowance.

	reconciliation of quantities; conservative and specific escalation assumptions and /or hedging; AND in all cases stable industry conditions	and/or hedging AND in all cases normal industry conditions	assumptions/ hedging; AND in all cases normal industry conditions	assumptions or minimal hedging; (or previous case but some concerns re commodity/ labour inflation)	respect to cost escalation; OR material concerns with respect to commodity/ labour inflation or labour/ commodity availability

ii) Strength of the Constructor and Relative Size of the Project (10% weight)

When the credit quality of the constructor or its guarantor is relevant to an assessment of the resilience of the constructor to cost over-runs and the likelihood of project completion, Moody's needs a sufficient understanding of the constructor to assess its credit strength and liquidity. However, in a typical PFI/PPP/P3 project, the credit quality of the constructor is not, in and of itself, a critical determinant of the credit quality of the project, because a financial failure of the constructor would not seriously jeopardize the project in light of mitigants. These generally include sufficient time and budget to replace the constructor, as well as third party support for the constructor's liquidated damage obligations. In most cases, we find it analytically useful to make a credit assessment[18] of the constructor without a need for the constructor to have a rating.

When the project has a high dependence on the constructor or on the damages provided by the constructor (especially if unsupported, or where support is viewed as uncertain in terms of quality or timeliness), a rating (which may be unpublished) could be required. A project would typically be viewed as having a high dependence on the contractor if the project would have a strong likelihood of not being able to repay its debt if the constructor were highly distressed.

In addition to assessing the credit strength of the constructor, we examine whether the size of the project is such that a cost overrun on that project could lead to stress for the constructor as well as the constructor's past history of supporting and completing projects that encountered material problems. We also evaluate the constructor's likely willingness to complete the project even if difficulties arise, which scenarios may include financial stress.

Everything else being equal, a large highly diversified constructor with strong profitability and liquidity has materially more scope to absorb losses on a problematic large project than a small local company that may be rendered insolvent by a single large loss. We note that while every seasoned constructor has experienced the odd problematic project, there are cases of constructors that seem to experience recurring issues with projects, so although a single stressed project may not be problematic for the company's financial health, a series of them might stress the constructor's ability to complete the Issuer's project.

[18] In this usage, "credit assessment" does not indicate a formal Input to Rating Services such as a structured finance credit assessment. Instead, it is more broadly an analytic judgment about the creditworthiness of the entity. Analysts may review and consider the constructor's size, market position, diversification, financials and order book; however, the quality and timeliness of information we receive on these factors can vary, and the assessment is not an input in the scorecard. As noted above, the credit quality of the constructor is not, in and of itself, a critical determinant of the credit quality of the PFI/PPP/P3 project.

	Weight	Aa	A	Baa	Ba	B	Caa
Strength of the constructor and relative size of the project	10%	Large and well diversified constructor (by geography and by business segment) with solid financials AND project annual spend represents less than 1% of the company's annual revenues	Large and well diversified constructor (by geography and business segment) with solid financials AND project annual spend represents less than 3% of the company's annual revenues	Solid large national/multi-regional constructor AND annual spend on the project is less than 3% of the company's annual turnover (or previous case but project annual spend represents 3-5% of company's annual revenues)	Solid regional constructor AND project annual spend is less than 3% of the company's annual turnover (or previous case but annual spend on project is 3-6% of annual revenues)	All other cases as long as constructor is financially healthy and project annual spend does not represent an undue amount of risk	Material short term or medium concern about the financial viability of the constructor and/or its willingness to support and complete troubled projects; Note that if the constructor is particularly weak financially or has a history of walking away from projects, a high degree of focus needs to be put on the analysis of the project resilience to a constructor replacement or Project Agreement termination

Factor 5: Resilience of Project to Construction Schedule Overrun (25% weight)

Why it Matters

Schedule overruns beyond the target date for substantial completion are not unusual in PFI/PPP/P3 projects and thus an assessment and understanding of the resilience of a project to such an overrun is crucial. Construction period budgets at financial close, including budgeted interest during construction, are normally only designed to be sufficient to allow the project to attain the target date for substantial completion (albeit based on a conservative draw down of funds). As a result, any delay beyond that date could result in liquidity stress and default if there is insufficient liquidity available to the Issuer.

In this factor, we assess how the Issuer can deal with delays before the target date for substantial completion and how long the issuer can meet all its obligations, including debt service, once the initial target date for substantial completion has passed. The ability of the project to withstand a schedule overrun will primarily depend on two major considerations: (i) construction schedule room and distance to long stop date, and (ii) quality and amount of liquidity available to the Issuer in order to meet scheduled or upcoming obligations if substantial completion occurs after the initial target date has passed.

How we Assess it for the Grid

i) Construction Schedule Room (10% weight)

A crucial consideration for assessing schedule risk in a PFI/PPP/P3 project is the contractual length of time allowed between the target date for substantial completion and the long stop date by which the project construction must be completed in order to avoid a Project Agreement termination. In this sub-factor, we assess the degree to which the long stop date gives a reasonable amount of time, in view of the complexity of the project, to complete its construction (e.g. whether there are short fuse hard deadlines, such as for Olympic games, existing asset retirement, etc). Normally, most PFI/PPP/P3 projects benefit from a one year period between the target date for substantial completion and the long stop date. However, some projects

have to deal with materially less time while others benefit from substantially more. In addition, the resilience of the Issuer to delay stress will depend on how the schedule is built and what the buffers are: for instance, does the construction schedule appropriately reflect vacations, the likelihood of weather delays, constraints with respect to certain tasks (e.g. seasonal restrictions on water work; night work only). Furthermore, we assess whether the schedule is built on a regular work day/week or whether it already assumes night and weekend work thus already precluding the possibility to increase the numbers of hours worked in order to deal with a delay. Another consideration is whether the assumptions as to productivity rates are reasonable or optimistic. Finally, this sub-factor looks at the schedule buffer already incorporated in the construction schedule to the target date for substantial completion, as most prudent constructors will already incorporate at least some schedule buffer. The schedule buffer is measured as the number of weeks identified in the construction schedule as being available to deal with a delay as a percentage of the total construction period, measured in weeks, from construction commencement to the target date for substantial completion (excluding the schedule buffer). The schedule buffer is assessed both in aggregate, by construction phase and with respect to the critical path.

	Weight	Aa	A	Baa	Ba	B	Caa
Construction schedule "Room"	10%	>15% schedule float; 18 months period between the target date for substantial completion and the long stop date and very conservative schedule build up	10-15% schedule float, 12 months (for simple projects) 18 months (for complex projects) between the target date for substantial completion and the long stop date and conservative schedule build up	5-10% schedule float, 12 months between the target date for substantial completion and the long stop date and appropriate schedule build up; or higher float/longer period between the target date for substantial completion and the long stop date but schedule already incorporates some limited partial acceleration measures (e.g. night work, week end work, double shift)	2-5% schedule float, 6-12 months period between the target date for substantial completion and the long stop date and appropriate schedule build up; or same as previous category but schedule already incorporates material acceleration measures for some aspects of the construction (e.g. night work, week end work, double shift)	2-5% schedule float, 6-12 months period between the target date for substantial completion and the long stop date but schedule already incorporates material acceleration measures for some aspects of the construction (e.g. night work, week end work, double shift)	Weaker characteristics than B category

ii) Liquidity Available to Meet Obligations After Initial Target Date for Substantial Completion (15% weight):

The calls on the liquidity of the Issuer are potentially numerous during construction, even absent a constructor replacement scenario. Some of the main triggers for calls on the Issuer's liquidity relate to:

» Having to meet scheduled obligations (debt service, insurance costs and other costs) post initial target date for substantial completion if substantial completion has not been achieved by that date. The reason for such delay could be either constructor borne risks or risks borne by the sponsoring government but the latter either has only granted a time relief or undertakes to pay compensation and that compensation is delayed (contractually or *de facto*).

» Having to pay for additional costs when such additional costs are borne by the Issuer (e.g. changes in law) or are borne by the sponsoring government but must be paid by the Issuer before they are received from the sponsoring government (or financed).

» Having to pay for debt service or any other costs in projects that rely on revenues during construction (availability payments or construction milestone payments) and the revenues are delayed due to construction delays.

In most PFI/PPP/P3 projects, the risks identified above are addressed through a number of mechanisms:

» Delay liquidated damages paid by the constructor and supported by highly rated and liquid instruments such as letters of credit. We note that the constructor may or may not agree to pay liquidated damages for sponsoring government borne risks.

» Reserves: we note that the debt service reserve fund may or may not be available at the initial target date for substantial completion.

» Constructor not being paid by Issuer for additional construction costs until funds are received by the sponsoring government.

The contractual arrangements with respect to liquidity can vary widely from project to project and a robust analysis of potential liquidity calls and liquidity sources to withstand a schedule overrun is a critical aspect of the risk analysis of a PFI/PPP/P3 project. In that analysis it's important to identify any liquidity timing gaps that could lead to potential stress for the Issuer and thus a potential debt default before substantial completion can be achieved. For the liquidity sources, it is crucial to not only analyze the amount of the liquidity available, but also its quality and the timing and triggers for accessing such liquidity instrument. A project that has weak liquidity but is otherwise strong may not be able to achieve investment grade unless there are other mitigating factors such as a very reasonable schedule with a material buffer. That is because, in case of delay, there may be insufficient funds to service debt and thus the threat of a debt default is high.

Given the need to access highly reliable liquidity on short notice in case of delays, we will only count towards available liquidity letters of credit issued by a highly rated bank, cash (e.g. a fully funded DSRF[19]) and other types of security when such type of security provides for timely payment and clearly supports the payment of liquidated damages and or financing costs and when it is issued by a highly rated counterparty. For all issuers of such letter of credit or other equivalent instrument, their rating is expected to be, at a minimum, in the A category for their instruments to be fully counted towards the liquidity of the project. In addition, we would expect that there will be triggers for draw downs if the rating of such issuer of letter of credit or similar instrument falls below a certain threshold and the issuer cannot be replaced.

In most PFI/PPP/P3 projects, the amount of liquidity is available for the whole period of the construction and is only released at substantial completion, once revenues start flowing. However, in some projects, the construction period has been structured in discrete and separate phases, with revenues starting to flow when each construction phase is completed. In those projects, liquidity may be released in stages as each construction phase is completed with very little left for the last phase of construction. We view these structures with partial releases of liquidity/security during construction as being weaker than the structures where all the liquidity and security is retained until substantial completion is achieved, because the scheduled release of liquidity may not match the actual de-risking profile of the project[20]. For these projects, the ability of the Issuer to withstand a schedule overrun is measured at the end of each phase and assuming all subsequent phases are delayed by the same length of time, just prior to the next release of liquidity. The minimum schedule overrun that the Issuer can withstand across every single phase without

[19] A fully funded DSRF at financial close or a committed amount that will be available to fund the DSRF on the original target date for substantial completion.

[20] De-risking of construction is not necessarily linear: for instance, many infrastructure projects incorporate material systems and equipment, the commissioning of which can expose the project to substantial delays in the last period of its schedule. In addition, some risks never disappear during construction. For instance, a weak contractor may be bankrupt towards the end of the construction period and may have to be replaced after incurring various delays.

defaulting is used for scoring purposes[21]. For non-phased projects, the ability to withstand a schedule overrun is measured starting at the initial substantial completion target date[22].

Some projects are structured with construction retention amounts that build over time and are not paid to the constructor until the project is completed. While these can be used as potential source of liquidity, it is necessary to examine the structure of such retention amount very carefully to assess their value from a liquidity point of view, including the following aspects: whether these amounts are available to pay debt service and other obligations in case of delay or whether they are solely set aside for the future benefit of the constructor (i.e. solely an incentive for the constructor to complete on time); how quickly the funds are expected to build up (obviously the retention account has very limited value in the initial months of construction).

Note that any part of the liquid security used notionally in order to deal with a schedule overrun cannot be used under Notching #2 to assess the resilience of the Issuer to a constructor replacement scenario or a Project Agreement termination scenario.

	Weight	Aa	A	Baa	Ba	B	Caa
Liquidity to accommodate schedule overrun	15%	Liquidity sufficient to withstand at least a 30% schedule overrun, min 18 months; very robust delay analysis and no gaps identified.	Liquidity sufficient to withstand a 25-30% schedule overrun, min 12 months; robust delay analysis and no material gap identified.	Liquidity sufficient to withstand a 20-25% schedule overrun, min 9 months; standard delay analysis and limited gaps identified.	Liquidity sufficient to withstand a 15-20% schedule overrun, min 6 months; somewhat limited delay analysis and some material gaps identified.	Liquidity sufficient to withstand a 6 months delay but less than 15 % schedule overrun; limited delay analysis and several material gaps identified.	Weaker characteristics than B and/ or other concerns re liquidity (e.g. quality).

Grid Notching Adjustments: Ease of Replacement of the Constructor & Amount and Quality of Security Available to Replace the Constructor or Mitigate Losses

Why it Matters

In a worst case scenario, the constructor fails to perform and deliver the asset or is so late that meeting the long stop date under the Project Agreement is going to be problematic[23]. The Issuer then has to replace the constructor with a new constructor charged to complete the project before the Project Agreement can be terminated. In addition, irrespective of how the project is progressing, there could be a need to replace the constructor if it becomes insolvent or bankrupt. In all likelihood such replacement will translate into additional costs for the Issuer, such as the costs to re-tender and enter into a new construction contract as well as potentially needing to fix the work that was not done correctly. In many cases, the Issuer has obtained from its constructor specific security that can be used in such replacement scenarios, and the project construction can be completed before the Project Agreement is terminated. However, in an extreme scenario, it may not be possible to replace the constructor at a price that can be paid out of the Issuer's available funds, and if none of the parties involved in the consortium is willing or able to provide additional

[21] For instance: a project has 3 phases; A, B and C; 50% of liquidity is released at completion of phase A and 25% at completion of phase B. One would test at the end of each phase how much of a schedule overrun can be incurred by the project without defaulting on its obligations: So one would test whether liquidity is sufficient to withstand a 3-6-9-12 months delay in Phase A (and phase B and phase C) with 100% of liquidity available; then a 3-6-9-12 month delay in Phase B and C once Phase A is completed and 50% of the liquidity has been released; then similar delays again in Phase C with the reduced liquidity after release of the liquidity when Phase B is completed. The minimum delay that can be sustained *across all phases* is the value used in the scoring of the sub-factor. So, in the preceding example if a delay of 9 months can be incurred across all phases prior to any release of security, then a delay of 6 months after the release of 50% of the liquidity and then 4 months after the release of 25% of the liquidity, the scoring would use the 4 months delay resilience.

[22] Projects that have material government contributions are also tested through the construction period to determine how long the project -and thus the government contribution- can be delayed before the project runs out of liquidity to service debt and pay any other costs: in some projects, liquidated damages from the constructor are only triggered if the target date for substantial completion is not met, as opposed to being paid when interim milestones are missed.

[23] Usually, the long stop date for the constructor is slightly shorter than under the Project Agreement, thus leaving some time for the constructor to be replaced and the project completed before a termination under the Project Agreement is triggered.

funding, the Project Agreement may be terminated. In some cases, the project may be so specialized or so large that replacing the constructor is not feasible, causing a termination of the Project Agreement. When the Project Agreement is terminated, the sponsoring government generally pays a termination amount and, while calculation specifics can vary, the loss to the equity providers and to the lenders will reflect a project cost-to-complete calculation[24].

How We Assess it for the Grid

We assess the ability of the Issuer to withstand a constructor replacement at a higher cost or for lenders to reduce their losses in the case of a Project Agreement termination. The resilience to withstand such a termination event (either constructor contract or Project Agreement) will primarily depend on two main sub-factors:

i) Ease of Replacement of Constructor

We assess the ease with which the Issuer may be able to replace the constructor in a stress scenario, including the quality, availability and number of companies that have the experience and the financial strength to replace the failed constructor in a timely manner in view of the type, location, and size of the project. Projects where the construction is undertaken by a design build joint venture (DBJV) score higher on this sub-factor if the following conditions are met: each party to the DBJV is deemed able to complete the project on its own if one of the DBJV party becomes bankrupt or insolvent, and the project documents are written in such a way that if a member of the DBJV fails to perform, the consortium parties are allowed sufficient time to demonstrate that the project can be completed by the remaining DBJV parties, and if not, to find a new partner to complete the project. While the DBJV construct does not help if the entire DBJV must be replaced for lack of performance or for not meeting the schedule deadlines, it does help in mitigating the credit risk of any single member of the DBJV: i.e. the crystallization of a higher contract cost is not immediate or is reduced even if one DBJV member fails. In addition, we assess the strength of other mechanisms available that can facilitate the replacement of a failed constructor such as whether there are labour and material bonds[25] available, or whether there are step-in rights available to the Issuer so that key sub-contracts continue even when the constructor has been terminated. Under this notching factor, we also assess whether the construction and operating maintenance/life cycle budget has close and recent comparables and if so, whether the pricing is within the comparable pricing or is materially different.

Notching for Ease of Replacement of Constructor

+1.0	+0.5	0	-0.5	-1.0	-2.0 or more
High degree of replacement ease either within DBJV or through availability of many suitable companies who could step in in a timely manner; extensive & robust mitigants to avoid loss of sub-contractors; pricing of construction contract and of operating , maintenance and life cycle costs at high end of comparables with such comparables being recent and relevant	Good degree of replacement ease either within DBJV or through availability of several suitable companies who could step in in a timely manner; material mitigants to avoid loss of sub-contractors; pricing of construction contract and of operating, maintenance and life cycle costs well within comparables with such comparables being recent and relevant	Moderate degree of replacement ease either within DBJV or through availability of a few suitable companies who could step in in a timely manner; some mitigants to avoid loss of sub-contractors; pricing of construction contract and of operating , maintenance and life cycle costs mostly within recent relevant comparables	Somewhat weak degree of replacement ease either through weak DBJV members, or very few suitable companies who could step in in a timely manner; weak mitigants to avoid loss of sub-contractors; pricing of the construction contract and of operating, maintenance and life cycle costs at the lower end of comparables or comparables are somewhat old or not close	Weak degree of ease of replacement; weak to non-existent mitigants for sub-contractor loss; pricing of construction contract and of operating, maintenance and life cycle costs somewhat below comparables or few comparables, or comparables are old	It is not expected that the failed constructor would be replaced in a timely manner due to the project nature or market conditions or both; likely to be no relevant comps

[24] We note that in some cases, that calculation may include not only the cost to complete the construction of the project but also an increased cost of delivering the operating, maintenance and life cycle services, since the sponsoring government will most likely reassess these costs in a termination context.

[25] A Labour & Material bond in North America typically ensures that sub-contractors and suppliers continue to be paid when the constructor fails to pay thus making it easier to avoid a complete stop of the work on the project if a constructor defaults.

ii) Amount & Quality of Security

Under this notching factor we assess the amount and quality[26] of security available to the Issuer and the lenders (*over and above* the liquidity available in the circumstances of a schedule overrun as detailed in Factor 5.ii) that would translate into *additional* funding available to replace a failed constructor or to complement a Project Agreement termination payment. This security may include letters of credit, adjudication bonds, performance bonds, contingent equity, etc. Before applying the notching in the table below, each instrument's face value will be adjusted with a haircut to recognize the wide range of instrument quality, timeliness and predictability of outcome. For instruments where a) the issuer is highly rated, b) the conditions for drawdowns are extensive and clear in the contract between the Issuer and the constructor; c) there are no conditions to payment on presentation and c) payment is timely, the haircut applied to the instrument for purposes of the notching is typically minimal or nil (for instance a letter of credit). As these conditions get weaker, the haircut will typically increase.

If the security is provided by a highly rated entity, the notching up for security can be improved somewhat from the straight application of the notching grid as long as the following criterion is met by the instrument:

» On demand instruments;

and as long as the following criteria are met by the instrument issuer:

» High rating, most likely in the Aaa/Aa category; may be a multi-lateral or similar type of organization

» Good track record of honouring their obligations without raising any defense or seeking to dispute the right to access the instrument when the beneficiary calls on the security

» Limited or no direct recourse to the construction company.

In a PFI/PPP/P3 environment, the constructor liability cap is expected to be between 30-50% of the contract price. Scoring may be shaded down if that level of liability cap is particularly weak (less than 30%) or conversely may be shaded up, if a material amount (as a general rule of thumb, over 10%) of unsecured liability cap (i.e. over and above what is secured) is provided by a solid investment grade entity[27]. In the latter case, we would not in most cases assign more than half a notch up because, once there is termination of the contract with the constructor, there is heightened likelihood of delays and disputes.

[26] By quality, we mean not only the quality of the issuer of such instrument but also the predictability of the outcomes when such instrument is called upon. With respect to the quality of the security, the full notching up for the applicable range is available only when the issuer of the instrument is investment grade and has a rating at least equal to that of the issuer (long term debt rating or insurance financial strength rating). With respect to predictability of outcome, by definition, when such instruments are called, there is a problematic situation and there are probably disputes, claims and counterclaims and difficult relationships between the parties as well as potential insolvencies and bankruptcies of certain parties. At that point there can be varying degrees of certainty as to the ability of the beneficiaries to enforce their rights under such instruments and get the full benefit of the instrument. For instance, insolvency of a constructor in some jurisdictions is not *per se* a breach of a contract thus limiting the usefulness of a particular instrument if it cannot be called upon at the time of the constructor insolvency, unless care has been taken to draft the instrument documentation in such a way that insolvency of the constructor would allow for the instrument to be called upon.

[27] Note that our ratings for PFI/PPP/P3 issuers assume that we will continue to receive information during construction that is sufficient to assess the parties whose financial strength is relevant to the Issuer's rating, which may include the constructor and its guarantor as well as other providers of liquidity and support. If there is a material decrease in the availability of important information or in the periodicity, freshness or quality thereof (e.g., withdrawal of a pertinent rating, material delays in receiving updated financial statements, or statements no longer being audited), the Issuer's rating may be negatively affected or may need to be withdrawn.

Notching for Security Available to Replace the Constructor or Mitigate Losses Arising from a Termination Payment

+2.5	+2.0	+1.5	+1.0	+0.5	0
High quality security (after application of haircuts – see note below) ≥ 25% of the construction price	High quality security (after application of haircuts – see note below) ≥ 20% but less than 25% of the construction contract amount	High quality security (after application of haircuts – see note below) is ≥ 15% but less than 20% of the construction contract amount	High quality security (after application of haircuts – see note below) is ≥ 9% but less than 15% of the construction contract amount	High quality security (after application of haircuts – see note below) is ≥ 5% but less than 9% of the construction contract amount	Security (after application of haircuts – see note below) is less than 5% of the contract amount; or any other amount where there is weak security quality

Note: Haircuts are applied in accordance with our assessment of the certainty of funding upon demand for such instruments in the relevant jurisdiction as well as their scope and features. We have observed considerable variation in the promptness and amount of funding not only among instrument types, but also among jurisdictions. The performance of instruments is a function of their terms and conditions as well as the legal and judicial framework of the jurisdiction and prevalent commercial practices, including the frequency of claim disputes. In addition, our assessment may be based on the performance history of a particular support provider as well as its financial strength. Since none of these factors is static, our assessments of appropriate haircuts evolve over time. As of the date of this methodology, general guidelines for typical instruments in jurisdictions where we have rated PFI/PPP/P3-Construction projects are as follows: Letters of credit from highly rated OECD banks and payable on demand upon presentation: no haircut; Australia performance bonds: 10% haircut; Australia adjudication bonds: 25% haircut; North America standard performance bond: 50% haircut; UK adjudication bond: 25% haircut.

Assumptions and Limitations, and Rating Considerations that Are not Covered in the Grid

The grid in this rating methodology represents a decision to favor simplicity that enhances transparency and to avoid greater complexity that would enable the grid to map more closely to actual ratings. Accordingly, the five rating factors and the two notching adjustments in the grid do not constitute an exhaustive treatment of all of the considerations that are important for rating PFI/PPP/P3 projects in construction. In addition, our ratings incorporate expectations for future performance and, in some cases, our expectations for future performance may be informed by confidential information that we can't disclose. In other cases, we estimate future results based upon past performance, industry trends or other factors. In either case, predicting the future is subject to the risk of substantial inaccuracy.

Assumptions that may cause our forward-looking expectations to be incorrect include unanticipated changes in any of the following factors: the macroeconomic environment and general financial market conditions, government policy, regulatory and legal actions.

Key rating assumptions that apply in this sector include our view that sovereign credit risk is strongly correlated with that of other domestic issuers, and that legal priority of claim affects average recovery on different classes of debt, sufficiently to generally warrant differences in ratings for different debt classes of the same issuer.

In choosing rating factors for this rating methodology grid, we did not explicitly include certain important factors that are common to all issuers in any industry such as the quality and experience of management, assessments of corporate governance and the quality of financial reporting and information disclosure. Therefore ranking these factors by rating category in a grid would in some cases suggest too much precision in the relative ranking of particular issuers against all other issuers that are rated in various industry sectors.

Ratings may include additional factors that are difficult to quantify or that have a meaningful effect in differentiating credit quality only in some cases, but not all. Such factors include financial controls, exposure to possible government interference in some countries. Regulatory, litigation, technology, and reputational risk as well as changes to macro-economic trends also affect ratings. While these are important considerations, it is not possible to precisely express these in the rating methodology grid without making the grid excessively complex and significantly less transparent. Ratings may also reflect circumstances in which the weighting of a particular factor will be substantially different from the weighting suggested by the grid. For instance, in a project where there are major concerns about the construction schedule, a heightened focus will be put on the analysis of the liquidity and security available to the Issuer to withstand a schedule overrun as well as a termination scenario.

Other Rating Considerations

» **Key Aspects of Standardization in PFI/PPP/P3 Projects**: The ratings grid is not designed to incorporate projects that deviate from the standard PFI/PPP/P3 project structure, so that actual ratings for such projects may vary widely from their grid-indicated outcome. Some of the key aspects of standardization in a PFI/PPP/P3 structure include:

- Equity funded upfront and, if not, equity commitment supported by a highly rated financial institution (non recourse to the Issuer) with such commitment accelerated upon certain events, including an event of default under the debt documents
- Equity provided by way of common stock, partnership units or very deeply subordinated instruments which behave, for all intents and purposes, like common equity
- All the funding required to complete construction completion is arranged/raised/available at financial close and there is no material concern with respect to any possible conditions that could lead to the required funds becoming unavailable (e.g. draw stop triggers in the case of bank funding, weak banks; reliance on revenues during construction)
- Perfected security interests in the material contracts, the Issuer's accounts, and the shares of the Issuer
- Any hedging is with highly rated counterparties with replacement rights if the counterparty's rating dips below certain thresholds
- No permitted distributions during construction until after substantial completion
- Structures to insulate the risk of the Issuer from that of its owner
- Lender step-in rights (e.g. to Project Agreement, construction contract)
- Substantially all design build obligations under the Project Agreement with the sponsoring government passed down to the constructor on a back-to-back basis under a fixed-price, date-certain contract, so that the Issuer only retains financing and management of the project
- Comprehensive construction insurance protection provided by creditworthy insurance companies and standard documentation so that the lenders' representative is named as additional insured, or mortgagee or loss payee as applicable
- Construction security is available through the construction period and only steps down post completion with an amount remaining sufficient to cover warranties and defects for an adequate period of time post completion
- No impediment for the Issuer to enforce its rights and obligations against the constructor (especially in case of common ownership)
- Rigorous independent verification of amounts to be paid to the constructor (including only paying for work done, testing for cost to complete, etc) and no unusual frontloading of the payments to the constructor ahead of the work
- Monitoring of construction through monthly reports from the lenders' technical advisor (in addition to a comprehensive report available at the time of the bid and updated at the time of financial close)
- Financial model (reviewed and found to be satisfactory by lenders' technical advisor or other advisor) showing all the sources and uses of funds during construction on a monthly basis with robust construction delay analysis
- Well tested PFI/PPP/P3 framework. We note that the great majority of the PFI/PPP/P3's we have rated are located in a handful of jurisdictions, mostly OECD countries, with a well established legal framework for such projects and, in many cases, highly standardized contracts. Should a project be located in a jurisdiction with a poorly tested PFI/PPP/P3 framework, where there is a lack of consensus on the PFI/PPP/P3 framework, and/or material concerns about the enforceability of

contracts or about the government's level of experience with PFI/PPP/P3 projects or its possible interference, then such concerns will be reflected in the rating analysis of the project. We note that the sovereign rating of a country may not necessarily be a good indicator of how supportive a specific government (whether sovereign or sub-sovereign) is of PFI/PPP/P3 projects and how predictable its behavior will be toward these entities.

» Rating Adjustments during Construction: Under normal circumstances, the rating of a PFI/PPP/P3 project in construction is not expected to change during construction as the project gets closer to completion, even assuming the project is on time and budget. The principal exceptions are projects composed of highly repetitive phases and where revenues start as each phase is completed. If the first phases are completed on time and budget and the other aspects of the project remains as strong as at the time of the initial rating assignment, the diminution of risk may lead to an upward movement in the rating towards the operating phase rating before all the phases are completed (noting however, that in several cases of phased construction, the liquidity and security provided by the constructor is also reducing as each phase is completed, in which case an upgrade or change of outlook may not occur until all phases are completed). Conversely, while the initial rating considers the potential for delays and the adequacy of risk mitigants, ratings during the construction period may face downward pressure (or may vary widely from grid-indicated ratings) for any number of reasons that may include but are not limited to: a) the incurrence of material delays such that reaching substantial completion by the target date may be jeopardized thus requiring draw downs of available liquidity, translating into stress for the constructor and potentially the need to replace it; b) a weakening of the construction support provided by the constructor or a material weakening in the credit quality of the constructor; or c) construction performance issues. In each case, our assigned ratings reflect our assessment of the overall risk profile of the project, its current circumstances and how much resilience there is to any issue or combination of issues.

» Credit Quality of Sponsoring Government: During the construction period, the quality of the sponsoring government entity is relevant if the sponsoring government is scheduled to make construction progress or milestone payments, in which case, its rating is a rating constraint of the project.

» Government Contributions during Construction: Government contributions during construction are now in evidence in many PFI/PPP/P3 projects in several jurisdictions and have ranged from very low percentages of construction costs (5-10%) to well over 50%, or even close to 70% of construction costs in some cases.

While government contributions during construction may be positive in terms of indicating a high level of support to the project from the sponsoring government, they may have a number of analytical implications that may be positive, neutral or negative.

a) Liquidity implications: as indicated under factor 5ii), the liquidity analysis of the project will take into account any potential delay in the payment of such government contribution if project construction is delayed (before and after original target date for substantial completion). For instance, if government contributions are paid when agreed-upon construction milestones are reached by the constructor and they are scheduled to partially pay debt service during construction, a delay in the receipt of the scheduled government funding may result in a debt default well before the end of construction if not properly mitigated. Conversely, government contributions paid at fixed, agreed-upon dates or as a percentage of construction costs incurred during any given month may have less negative impact from a liquidity risk perspective.

b) Termination payment implications: the analysis of the terms and conditions applicable to the calculation of the termination payment in case of Issuer default in the Project Agreement will dictate whether the government contributions are viewed as supportive, neutral or adverse for lenders. At a very high level, the termination payment calculated after a Project Agreement termination event incorporates a number of elements, the largest one generally being an estimate

of the cost to complete the project over and above the original construction price. In a supportive scenario, the sponsoring government will absorb most if not all of the cost to complete penalty (i.e. senior lenders and equity are effectively "super" senior to the government funding); in a neutral scenario, the sponsoring government and the private sector will share the losses related to completing the project (i.e. the senior lenders and the government funding will effectively be *pari passu*); in an adverse scenario, the private sector funders will take all the losses related to the completion of the project before the sponsoring government takes any loss (in effect the government funding is "super" senior to senior lenders and equity). It is worth noting that in the great majority of cases the impact of the government contributions is expected to be adverse to lenders since, by nature, a PFI/PPP/P3 project's goal is to transfer construction risk to the private sector. The reason that government contributions tend to be negative in most PFI/PPP/P3 projects is that the asset risk of incurring a cost overrun is carried by a smaller private sector capital base, compared to a project without government contributions. While government contributions during construction (assuming they are made as scheduled) do not change the probability of the occurrence of a termination event for the project (and thus a debt default), they potentially increase the percentage of loss given default for private sector lenders.

The analysis of the impact of the government contributions on the Issuer's debt ratings will incorporate the following elements:

- The terms and conditions of the termination payment provisions in the Project Agreement
- The timing and nature of the government contributions (for instance government contributions paid at substantial completion as opposed to during construction can, for all intents and purposes, be treated as a first availability payment and are thus neutral).
- The Issuer's credit profile considering all factors other than government contributions. Since government contributions that are made as scheduled do not impact the probability of default even if they are super-senior to lenders, their impact on the risk of project lenders is strongly related to the Issuer's risk of project non-completion:
  - When the Issuer's credit profile is otherwise solidly investment grade and the risk of project non-completion is low, the impact of government contributions during construction is low.
  - When the Issuer's credit profile is otherwise deeply speculative grade and risk of project non-completion is high, the impact of government contributions is high.
  - When the Issuer's credit profile is changing (for instance due to more challenging construction conditions) and government contributions are part of the financing structure, our view of the project may change based both on the change in conditions itself and the impact of government contributions on project lenders, especially if the risk of project non-completion is increasing.
- The percentage of the government contributions in relation to the total project funding: where the impact of government contributions is viewed as material based on the above considerations, the higher the percentage of government contributions, the higher the potential impact on the Issuer's debt rating.

- **Application of the methodology to PFI/PPP/P3's that have no operating period (DBF)**. This methodology applies to DBF's except that, in all likelihood, there will not be any long-term project equity interest independent of the constructor. As a result, the enforcement of all contractual obligations vis-a-vis the constructor will need to be taken by the debt funders and thus the experience and effectiveness of the funders group will be a key rating consideration. In addition, the DBF model carries a number of other specific risks factors:
  - Ownership and insulation of the issuer from its constructor owner

- Structure of the debt in particular with respect to the term of the debt versus the target date for substantial completion
- Insulation of lenders from the government withholding final payments for holdbacks and/or deficiencies
- Government rating

» Corporate Governance. Among the areas of focus in corporate governance are audit committee financial expertise, the incentives created by executive compensation packages, related party transactions, interactions with outside auditors, and ownership structure.

» Financial Controls. We rely on the accuracy of audited financial statements to assign and monitor ratings in this sector. The quality of financial statements may be influenced by internal controls, including centralized operations and the proper tone at the top and consistency in accounting policies and procedures. Auditors comments in financial reports and unusual financial statement restatements or delays in regulatory filings may indicate weaknesses in internal controls.

Appendix A: PFI/PPP/P3 Projects in Construction: Methodology Factor Grid

Factor 1: Construction risk allocation between the private sector and the public sector (5%)

Aa	A	Baa	Ba	B/Caa
The sponsoring government retains most of the construction risks through delay and compensation events; timely compensation; highly supportive contract terms and conditions	The sponsoring government retains some material construction risks that are usually borne by the private sector with appropriate time relief and compensation; timely compensation; supportive contract terms and conditions	The sponsoring government and private sector have a standard risk allocation; For the risks retained by the sponsoring government, appropriate levels of time relief and compensation; standard overall PFI/PPP/P3 terms and conditions	The private sector retains more construction risks than in a standard allocation of risks and these risks can be material; or thresholds for time relief and compensation are high or the risk allocation is somewhat unclear; overall contract terms and conditions have some areas of concern	The private sector retains most construction risks with very little allocated to the sponsoring government; unusual terms and conditions of the Project Agreement that lead to material specific concerns

Factor 2: Project construction complexity (25%)

Factor 2.i) Site preparation requirements & substructure risk

Aa	A	Baa	Ba	B	Caa
Well understood and simple geology; very limited site area; very limited scope and complexity of construction site preparation and very limited need to build substructures, all well within known and simple technologies	Well understood and primarily simple geology; limited site area; limited scope and complexity of construction site preparation; limited need for substructures, all within known and essentially simple technologies	Well understood and moderately complicated geology; manageable/ standard site area; site preparation requirements that do not entail very lengthy processes or blasting or tunneling; normal substructures (but excluding material/ extensive deep foundations), all within standard technologies	Well understood and somewhat more complicated geology; fairly extensive site; some aspects of the project have complex or lengthy site preparation requirements such as some limited blasting, cut and cover tunnels or surcharge pre-loading requirements and some substructures may be complex but usually all within accepted techniques	Complex geology; extensive site; complex , extensive, lengthy site preparation requirements that may require extensive blasting; complex/extensive substructures; some unusual or complex techniques required	Unusual/difficult geology; very extensive site; the project is unique, few precedents with that combination and extent of site preparation risks and substructure risk; unique techniques or equipment required (such as a tunnel boring machine)

Factor 2.ii) Structure complexity and construction technique risk

Aa	A	Baa	Ba	B	Caa
Very simple structure; highly repetitive; very well tested and very simple design and construction techniques; material offsite work; several independent elements; very well known and highly appropriate materials for the project	Simple structure with a material level of repetitiveness; simple normal design and construction techniques; some offsite work possible on some elements of the project; some material ability to work independently on various aspects of the project; generally well known and appropriate materials	Structure of standard complexity; well understood design and construction techniques although they could have a certain element of complexity; some repetitive elements within at least a material part of the project; may have a few complex elements for the more unique parts of the project (e.g. mechanical floor in a hospital) but well within industry norms and experience; project is mostly sequential and has limited offsite work; materials generally appropriate for the project	Some complex structural elements; may require material testing to demonstrate that the asset can withstand a range of events (wind, etc); minimal repetition; some complex or unusual design and construction techniques; project is essentially sequential with minor offsite work; may incorporate less well tested materials in some parts of the project	Several complex, unique elements of the structure; extensive testing to demonstrate that the asset can withstand a wide range of events (wind, etc); complex and/or unusual design and construction techniques; project structure is highly sequential and is all essentially built on site; materials used may be unusual or untested for a material portion of the project	Many complex, unique elements in the design, structure, techniques and materials that, singly or in combination, cause a very high degree of construction risk

Factor 2.iii) Performance risk

Aa	A	Baa	Ba	B	Caa
Few very simple mechanical and electrical (M&E) systems, IT and equipment need to be installed –all well proven technology; these components of the project are a small percentage of construction budget (typically less than 5-10%); availability & performance standards to reach substantial completion are limited in scope and highly achievable; very short commissioning period (<2 months)	Simple M&E systems, IT and equipment need to be installed –all proven technology; these components of the project are a relatively small percentage of construction budget (typically 10-20%); availability & performance standards to reach substantial completion are relatively limited in scope and can be easily achieved; short commissioning period (<3-4 months)	M&E systems, IT and equipment required are standard for the asset although they can have a certain degree of complexity – generally proven technology; these components represent a material percentage of the construction budget (20-35%); Availability & performance standards to reach substantial completion follow industry norms and may have some degree of stringency; moderate commissioning period of 4-6 months	M&E systems, IT and equipment required are relatively extensive and complex- some elements may not be well proven; these components represent a large proportion of the construction budget (35% - 55%); several strict standards with respect to performance and availability to reach substantial completion, some of which may be above industry norms; relatively lengthy commissioning period of 6-9 months	M&E systems, IT and equipment required are extensive and complex- several elements may not be proven (i.e. custom made); these components represent a very substantial portion of the construction budget (55-75%); very high standards of performance and availability in most of the facility to reach substantial completion, several of which may be above industry norms or may be unusual; lengthy commissioning period of 9-12 months	M&E systems, IT and equipment required are extensive and unique; mostly a custom order M&E, IT or equipment project; extremely high and unique performance and availability standards; extensive commissioning period (>1 year)

Factor 2.iv) Construction constraints risk (10%)					
Aa	**A**	**Baa**	**Ba**	**B**	**Caa**
No material constraints beyond constraints generally applicable to the industry (e.g. vacations, weather; widely known construction laws and regulations); no constraint that could impact the critical path	A few manageable constraints, not expected to result in requirements for material work around; restrictions set at very workable levels; only impacts a limited period of the project construction; no material constraints that could impact the critical path	A few manageable constraints with some well understood and relatively simple work around requirements; restrictions set at workable levels; constraints affect only a reasonably limited period of the project; limited impact on critical path	Several constraints and restriction levels are such that material workaround is required but the workaround solutions have precedents and a reasonable degree of predictable results; if workaround cannot be implemented, it could have a material impact on the critical path; restrictions affect several phases of the project.	Many constraints or unusual constraints; restriction levels that are restraining or have limited precedents for workarounds; high risk of material impact on critical path if work cannot be done efficiently and in a timely basis as a result of all the constraints; restrictions are pervasive through the whole length of the project	The project as a whole is subject to a multitude of constraints affecting most of the construction period; restrictions set at tight levels; highly unusual workaround solutions; impact on critical path could be extremely deleterious if work cannot proceed as a result of the constraints

Factor 3: Constructor/consortium experience and project readiness (25%)					
Factor 3.i) Constructor/consortium experience (15%)					
Aa	**A**	**Baa**	**Ba**	**B**	**Caa**
Extensive successful track record in jurisdiction, with type and size of project, and with PFI/PPP/P3's; very robust oversight and project management; consortium members have excellent track record of working together	Good track record in jurisdiction with type and size of project, and with PFI/PPP/P3's; robust oversight and project management; consortium members have good track record of working together	Good track record in two out of the three areas (PFI/PPP/P3, project type/size, country); adequate oversight and project management; consortium members have limited but successful track record of working together	Good track record in one out of three areas of experience (PFI/PPP/P3, project type/size, country); potentially weak project management and oversight; consortium members have limited track record of working together	Limited track record in all 3 areas (PFI/PPP/P3, project type/size, country); weak project management and project oversight; consortium members have no track record of working together	Questionable track record in all respects; inexperienced project management and/or ineffective project oversight; Note that in that case, a high degree of focus needs to be put on a constructor replacement scenario and/or a Project Agreement termination event

Factor 3.ii) Project readiness & risk management (10%)					
Aa	**A**	**Baa**	**Ba**	**B**	**Caa**
Very conservative approach throughout; evidence of active and extensive risk reduction strategies employed throughout the project design and preparedness to mitigate the risks identified under factor 2[28]; high degree of confidence that such strategies will sufficiently mitigate the risks and will have predictable results; very limited risk exposure to material sub-contractors availability and credit risk through pre-identification, pre-clearance, material diversification and material security posted by such sub-contractors; well established and solid supply chain management (SCM)	Evidence of active and material risk reduction strategies employed throughout the project design and preparedness for all of the major risks identified under factor 2; good degree of confidence that such strategies will help mitigate such risks; limited exposure related to material sub-contractors availability and credit risk through pre-identification, pre-clearance, good diversification and material security posted by the material sub-contractors; good SCM	Normal, standard approach to bid/project and identified risks including close coordination with the facilities management provider during the design/construction period; partial mitigation of some risks or lower degree of comfort that the risk mitigation strategies will result in predictable outcomes; some larger identified critical sub-contractors but risk well mitigated through security; material percentage of the project may not have identified sub-contractors for smaller contracts but no concern with respect to availability of such sub-contractors at prices within budget; adequate SCM	A few aspects of the project approach/bid approach are exposed to risks that cannot be entirely mitigated or for which the de-risking strategies may not have a high degree of outcome predictability; potential risk associated with one or more critical sub-contractors and there are some gaps in the security being posted; high percentage of project may not have identified subs but no concern with respect to the availability of such subs; generally adequate SCM	Several large elements of the bid approach/ project are representing additional risk that cannot be mitigated; large critical sub-contractor risk with such key sub-contractor not easily replaceable without lengthy delays; limited security taken from critical sub-contractors; concerns with respect to the availability of sub-contractors; weak SCM	Very aggressive approach to risk throughout the project, bid and for the project approach; very little thought given to risk mitigation; high dependence on high risk key sub-contractors with no security being taken; high degree of concern with respect to the availability of sub-contractors; untested or very weak SCM
Factor 4: Resilience of constructor to cost overruns (20%)					
Factor 4.i) Profit margin & contingency & robustness of budget build-up (10%)					
Aa	**A**	**Baa**	**Ba**	**B**	**Caa**
Very strong profit margin and contingency characteristics given the type of project and industry conditions; highly disciplined budget build up methods with independent reconciliation of quantities; conservative and specific escalation assumptions and /or hedging; AND in all cases stable industry conditions	Strong profit margin and contingency characteristics given the type of project and industry conditions; disciplined budget build up; robust escalation assumptions and/or hedging AND in all cases normal industry conditions	Average profit margin and contingency characteristics given the type of project and industry conditions; adequate budget build up; adequate escalation assumptions/ hedging; AND in all cases normal industry conditions	Below average profit margin and contingency characteristics given the type of project and industry conditions; somewhat weak budget build up; general CPI escalation assumptions or minimal hedging; (or previous case but some concerns re commodity/ labour inflation)	Below average profit margin and contingency characteristics given the type of project and industry conditions; weak budget build up; somewhat aggressive assumptions with respect to cost escalation; OR material concerns with respect to commodity/ labour inflation or labour/ commodity availability	All other cases; including if there are strong concerns about overall industry construction conditions and constructors bidding at very thin margins, or at a loss, to win contracts

[28] So for instance, if geological conditions are identified as a risk in factor 2, to score well in this sub-factor 3 ii) the constructor would need to demonstrate that it has undertaken additional geological studies, and/or selected design choices that take into account the potential uncertainty with respect to geological conditions, and/or settled on a schedule that provides adequate buffer to spend more time on site preparation and excavation/piling so that ultimately, geological risk is materially reduced.

Factor 4.ii) Strength of the constructor and relative size of the project (10%)

Aa	A	Baa	Ba	B	Caa
Large and well diversified constructor (by geography and by business segment) with solid financials AND project annual spend represents less than 1% of the company's annual revenues	Large and well diversified constructor (by geography and business segment) with solid financials AND project annual spend represents less than 3% of the company's annual revenues	Solid large national/multi-regional constructor AND annual spend on the project is less than 3% of the company's annual turnover (or previous case but project annual spend represents 3-5% of company's annual revenues)	Solid regional constructor AND project annual spend is less than 3% of the company's annual turnover (or previous case but annual spend on project is 3-6% of annual revenues)	All other cases as long as constructor is financially healthy and project annual spend does not represent an undue amount of risk	Material short term or medium concern about the financial viability of the constructor and/or its willingness to support and complete troubled projects; Note that if the constructor is particularly weak financially or has a history of walking away from projects, a high degree of focus needs to be put on the analysis of the project resilience to a constructor replacement or Project Agreement termination

Factor 5: Resilience of project to construction schedule overrun (25%)

Factor 5.i) Construction schedule room (10%)

Aa	A	Baa	Ba	B	Caa
>15% schedule float; 18 months period between the target date for substantial completion and the long stop date and very conservative schedule build up	10-15% schedule float, 12 (for simple projects)-18 months (for complex projects) between the target date for substantial completion and the long stop date and conservative schedule build up	5-10% schedule float, 12 months between the target date for substantial completion and the long stop date and appropriate schedule build up; or higher float/longer period between the target date for substantial completion and the long stop date but schedule already incorporates some limited partial acceleration measures (e.g. night work, week end work, double shift)	2-5% schedule float, 6-12 months period between the target date for substantial completion and the long stop date and appropriate schedule build up; or same as previous category but schedule already incorporates material acceleration measures for some aspects of the construction (e.g. night work, week end work, double shift)	2-5% schedule float, 6-12 months period between the target date for substantial completion and the long stop date but schedule already incorporates material acceleration measures for some aspects of the construction (e.g. night work, week end work, double shift)	Weaker characteristics than B category

Factor 5.ii) Liquidity to withstand a schedule overrun (15%)

Aa	A	Baa	Ba	B	Caa
Liquidity sufficient to withstand at least a 30% schedule overrun, min 18 months; very robust delay analysis and no gaps identified.	Liquidity sufficient to withstand a 25-30% schedule overrun, min 12 months; robust delay analysis and no material gap identified.	Liquidity sufficient to withstand a 20-25% schedule overrun, min 9 months; standard delay analysis and limited gaps identified.	Liquidity sufficient to withstand a 15-20% schedule overrun, min 6 months; somewhat limited delay analysis and some material gaps identified	Liquidity sufficient to withstand a 6 months delay but less than 15 % schedule overrun; limited delay analysis and several material gaps identified.	Weaker characteristics than B and/ or other concerns re liquidity (e.g. quality).

Notching for ease of replacement of constructor

+1.0	+0.5	0	-0.5	-1.0	-2.0 or more
High degree of replacement ease either within DBJV or through availability of many suitable companies who could step-in in a timely manner; extensive & robust mitigants to avoid loss of sub-contractors; pricing of construction contract and of operating , maintenance and life cycle costs at high end of comparables with such comparables being recent and relevant	Good degree of replacement ease either within DBJV or through availability of several suitable companies who could step-in in a timely manner; material mitigants to avoid loss of sub-contractors; pricing of construction contract and of operating, maintenance and life cycle costs well within comparables with such comparables being recent and relevant	Moderate degree of replacement ease either within DBJV or through availability of a few suitable companies who could step-in in a timely manner; some mitigants to avoid loss of sub-contractors; pricing of construction contract and of operating , maintenance and life cycle costs mostly within recent relevant comparables	Somewhat weak degree of replacement ease either through weak DBJV members, or very few suitable companies who could step-in in a timely manner; weak mitigants to avoid loss of sub-contractors; pricing of the construction contract and of operating, maintenance and life cycle costs at the lower end of comparables or comparables are somewhat old or not close	Weak degree of ease of replacement; weak to non-existent mitigants for sub-contractor loss; pricing of construction contract and of operating, maintenance and life cycle costs somewhat below comparables or few comparables, or comparables are old	It is not expected that the failed constructor would be replaced in a timely manner due to the project nature or market conditions or both; likely to be no relevant comps

Notching for security available to replace the constructor or mitigate losses arising from a termination payment

+2.5	+2.0	+1.5	+1.0	+0.5	0
High quality security (after application of haircuts – see note below) ≥ 25% of the construction price	High quality security (after application of haircuts – see note below) ≥ 20% but less than 25% of the construction contract amount	High quality security (after application of haircuts – see note below) is ≥ 15% but less than 20% of the construction contract amount	High quality security (after application of haircuts – see note below) is ≥ 9% but less than 15% of the construction contract amount	High quality security (after application of haircuts – see note below) is ≥ 5% but less than 9% of the construction contract amount	Security (after application of haircuts – see note below) is less than 5% of the contract amount; or any other amount where there is weak security quality

Note: Haircuts are applied in accordance with our assessment of the certainty of funding upon demand for such instruments in the relevant jurisdiction as well as their scope and features. We have observed considerable variation in the promptness and amount of funding not only among instrument types, but also among jurisdictions. The performance of instruments is a function of their terms and conditions as well as the legal and judicial framework of the jurisdiction and prevalent commercial practices, including the frequency of claim disputes. In addition, our assessment may be based on the performance history of a particular support provider as well as its financial strength. Since none of these factors is static, our assessments of appropriate haircuts evolve over time. As of the date of this methodology, general guidelines for typical instruments in jurisdictions where we have rated PFI/PPP/P3-Construction projects are as follows: Letters of credit from highly rated OECD banks and payable on demand upon presentation: no haircut; Australia performance bonds: 10% haircut; Australia adjudication bonds: 25% haircut; North America standard performance bond: 50% haircut; UK adjudication bond: 25% haircut.

Moody's Related Research

The credit ratings assigned in this sector are primarily determined by this credit rating methodology. Certain broad methodological considerations (described in one or more secondary or cross-sector credit rating methodologies) may also be relevant to the determination of credit ratings of issuers and instruments in this sector. Potentially related secondary and cross-sector credit rating methodologies can be found here.

The above link can be also be used to access any Moody's rating methodology referenced in this report.For data summarizing the historical robustness and predictive power of credit ratings assigned using this credit rating methodology, see link.

For definitions of Moody's most common ratio terms, please see Moody's Basic Definitions for Credit Statistics (User's Guide), June 2011.

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» contacts continued from page 1

NEW YORK +1.212.553.1653

Earl Heffintrayer +1.212.553.1770
Assistant Vice President - Analyst
earl.heffintrayer@moodys.com

LONDON +44.20.7772.5454

Douglas Segars +44.20.7772.1584
Associate Managing Director
douglas.segars@moodys.com

Tomas O'Loughlin +44.20.7772.1798
Vice President - Senior Credit Officer
tomas.oloughlin@moodys.com

SYDNEY +61.2.9270.8100

Terry Fanous +61.2.9270.8125
Managing Director – Public Project & Infrastructure Finance
terry.fanous@moodys.com

Arnon Musiker +61.2.9270.8161
Senior Vice President
arnon.musiker@moodys.com

Report Number: 190464

Author
Catherine Deluz

Senior Production Associate
Joby Mathew

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