Criteria | Corporates | Project Finance:

Project Finance Operations Methodology

September 16, 2014

*(**Editor's Note:** This article has been superseded by "General Project Finance Rating Methodology," published Dec. 14, 2022, except in jurisdictions that require local registration.)*

1. This article describes S&P Global Ratings' methodology and assumptions for assessing project finance operating risks.
2. The criteria are intended to enhance the comparability of our project finance issue credit ratings with ratings in other sectors (see "Understanding S&P Global Ratings' Rating Definitions," published June 3, 2009) and increase the transparency about how we assign project finance issue credit ratings. The criteria constitute specific methodologies and assumptions under our "Principles Of Credit Ratings," published Feb. 16, 2011.
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SCOPE OF THE CRITERIA

4. These criteria apply to all new and existing project finance issue credit ratings.

SUMMARY OF THE CRITERIA

5. The methodology establishes an operations phase stand-alone credit profile (SACP), which reflects our assessment of the likelihood that a project would meet its financial commitments during the operations phase. The operations phase begins when the construction phase ends and continues until the end of a project's life or until full repayment of the project's debt. For debt structures with bullet or balloon maturities (see the Glossary in "Project Finance Framework Methodology," published Sept. 16, 2014), our analysis includes risks after scheduled debt maturities (including refinance risk).
6. Projects can have distinct phases during operations. We analyze each phase separately if there are material credit quality differences between the phases. The operations phase SACP reflects the credit quality of the weakest phase. For example, a project may have an initial ramp-up period, followed by a period of stabilization, and then an end-of-life phase. Another example would be a project that initially has a fully contracted revenue stream, followed by a merchant period, during which it is subject to market forces.
7. The operations phase SACP is a component in determining the overall rating on a project, as summarized in the project finance ratings framework (see chart 1). In addition, we have published key credit factors criteria articles that describe the industry risk assessments associated with each sector and provide additional analytical guidance.

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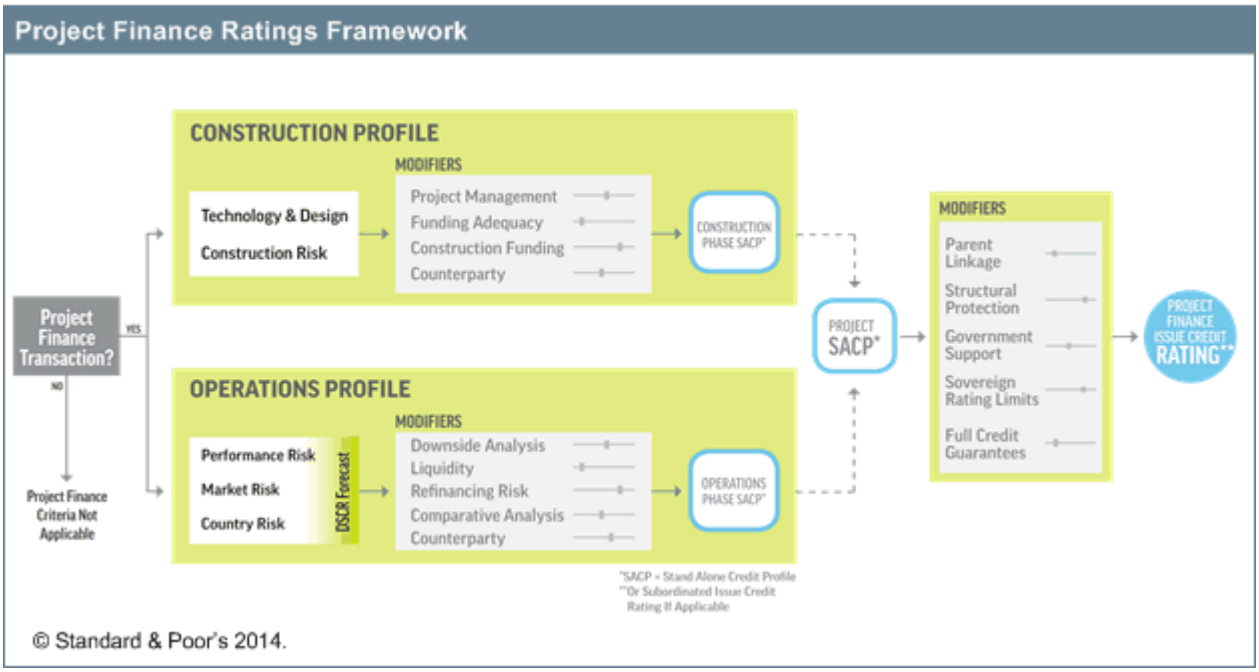
Chart 1



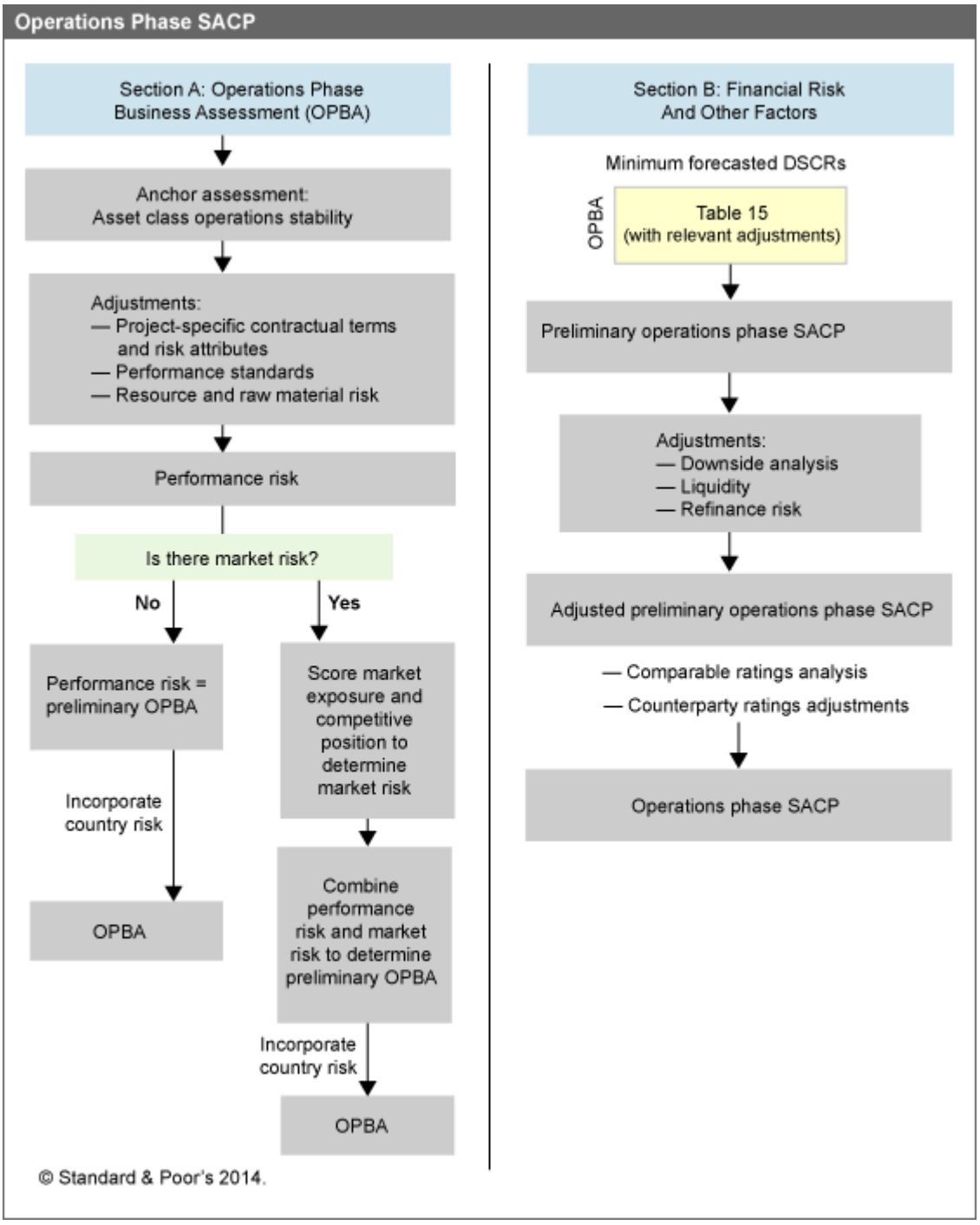
8. The criteria set out a multistep framework to assess the operations phase SACP (see chart 2). We first establish a project's operations phase business assessment (OPBA). The main factors to determine the OPBA are:

   - Performance risk assessment: We determine this by analyzing asset class operations stability and then adjusting for several factors, including project-specific contractual terms and risk attributes, performance standards, and resource and raw material risk.
   - Market risk assessment: Market risk only applies when a project's cash flow available for debt service (CFADS) has the potential to decline by more than 5% from our base case to our downside case due to market risk. In such cases, we then assess the project's market exposure (an assessment of its CFADS volatility due to market forces) and its competitive position.
   - Country risk.

9. We then assess financial risks and other factors to determine the operations phase SACP through the following steps:

   - Based on a project's OPBA, the minimum forecasted debt service coverage ratios (DSCRs) typically establish the preliminary operations phase SACP.
   - We then adjust the preliminary operations phase SACP for several factors--mainly our downside analysis, debt structure, liquidity, and refinance risk--to determine the adjusted preliminary operations phase SACP.
   - Finally, we use a comparative ratings analysis and counterparty ratings adjustments to arrive at the operations phase SACP.

Chart 2



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METHODOLOGY

12. These criteria assign an operations phase SACP to a project. We first determine a project's OPBA and then incorporate our assessments of financial risk and other factors. This article is one of five that comprise our project finance criteria. The other four are:

- Project Finance Framework Methodology, Sept. 16, 2014;
- Project Finance Transaction Structure Methodology, Sept. 16, 2014;
- Project Finance Construction Methodology, Nov. 15, 2013; and
- Project Finance Construction And Operations Counterparty Methodology, Dec. 20, 2011.

13. The framework methodology article describes how the individual articles, including this one, interrelate and how we determine the project finance issue credit rating.

A. Operations Phase Business Assessment

14. Under the criteria, the OPBA reflects our overall view of relative cash flow variability, which can result from performance (or operational) and market risks. We assess performance risk in all cases unless all performance risk is completely transferred to a counterparty. We assess market risk in the cases where market risk is material. We define material market risk as projects whose CFADS has the potential to decline by more than 5% from our base case to our downside case because of price or volume changes. We assess performance risk on a 1-12 scale and market risk on a 1-5 scale. We then combine these two assessments to determine the preliminary OPBA (see table 1). The criteria then factor in country risk to arrive at the OPBA (see paragraphs 54-61 and table 14).

Table 1

Preliminary OPBA

	--Market risk--					
Performance risk	**N/A**	**1**	**2**	**3**	**4**	**5**
1	1	3	5	7	9	11
2	2	3	5	7	9	11
3	3	4	6	8	10	11
4	4	5	6	8	10	11
5	5	6	7	9	10	11
6	6	7	8	9	10	11
7	7	8	9	10	10	12
8	8	8	9	10	11	12
9	9	10	10	11	12	12
10	10	10	11	11	12	12
11	11	11	12	12	12	12
12	12	12	12	12	12	12

15. In rare cases, contractual provisions can transfer all performance and market risks to a counterparty, such that a project will continue to receive a forecasted level of cash flow

irrespective of operational performance or market conditions. If we determine that the risk transfer is adequate, contractual cash flows are sufficient for full and timely repayment, and cancellation and termination provisions are appropriately restricted, then we will not assess the project's operations phase SACP. In these cases, the project SACP is the lower of the construction SACP or the counterparty dependency assessment (CDA) as defined in the project finance construction and operations counterparty methodology (paragraph 23). An example would be a project that, for the life of the debt, acts simply as an intermediary buying a product from one party at a fixed price and selling it to another party for a higher fixed price, with essentially zero operations and maintenance (O&M) costs and revenue earned regardless of operational performance.

16. Projects can have distinct phases during operations. As an example, a project may have an initial ramp-up period, followed by a period of stabilization, and then, ultimately, an end-of-life phase. Another example would be a project that initially has a fully contracted revenue stream, followed by a merchant period during which it is subject to market forces. In these cases, we analyze each phase separately if there are material credit quality differences between the phases. The operations phase SACP reflects the credit quality of the weakest phase.

17. Projects often use contractual agreements to mitigate or transfer risk. Doing so may improve the operations phase SACP but can create a counterparty dependency (see "Project Finance Construction And Operations Counterparty Methodology"). In some cases, otherwise beneficial contracts would be excluded from the operations phase analysis because of the counterparty's creditworthiness (see paragraphs 101-103).

18. The criteria address the role and impact of contracts within performance risk:

    - Project-specific contract terms and risk attributes address how contracts may mitigate O&M and technology risks.
    - Performance standards address the risks that projects may not meet minimum standards that revenue contracts require and may incur penalties.
    - Resource and raw materials address how contracts may insulate projects from having inadequate resources or raw materials supplies.

19. Finally, the market risk analysis addresses the extent to which contracts insulate a project from market forces. Depending on the form, terms, and conditions of the contracts, they can transfer or mitigate market risk, resulting in a project potentially being immune to market risk. An example of a project with fully mitigated market risk is a fully contracted power plant that receives fixed payments regardless of market conditions.

20. We analyze a project's contracts individually and in the context of its other contracts in assessing both performance risk and market risk. Certain contracts work in tandem to mitigate risk. A project's contracts must meet the following characteristics to effectively mitigate risk:

    - Transfer risk to the counterparty under all likely operating and market conditions;
    - Provide clear definitions of roles and responsibilities of each counterparty, especially when two or more counterparties are performing interrelated tasks;
    - Include highly restrictive conditions for changing contract terms;
    - Include highly restrictive force majeure (see the Glossary in "Project Finance Framework Methodology") conditions under which a counterparty is excused from meeting its obligations; and
    - Have termination conditions that are highly unlikely to be realized.

1. Performance Risk

21. Performance risk evaluates a project's ability to deliver products and services reliably and to meet contracted specifications consistently as required.

22. To determine a project's performance risk, the criteria first assess asset class operations stability on a 1-10 scale, with 1 indicating the lowest risk. We then could make adjustments to this for project-specific contractual terms and risk attributes, performance standards, and resource and raw material risk. The adjustments can raise or lower the asset class operations stability assessment to determine performance risk, subject to the assessment being no lower than 1 and no higher than 12.

a) Asset class operations stability

23. Under the criteria, asset class operations stability assesses the risk that a project's cash flow will differ from expectations as a result of it being unable to provide services or products based on the type of activities it is engaged in. Projects with lower numerical asset class operations stability assessments (indicating lower risk) tend to have simpler business activities or processes that are less prone to breaking down unexpectedly, resulting in less risk of unexpected cash flow loss. Conversely, projects with higher numerical asset class operations stability assessments (indicating higher risk) tend to have complex and sometimes interrelated activities that can severely affect performance in the event of an operational breakdown, resulting in a higher risk for unexpected cash flow loss.

24. Chart 3 and table 2 show the general characteristics associated with the various operations stability assessments and how we assess the asset classes. The assessments typically focus on the sophistication of mechanical and electrical components and their interlinkages, as well as the challenges of managing the general operations and maintenance of those assets. The factors are usually predictive of a project's likelihood of not meeting operational expectations and, therefore, cash flow forecasts. In these assessments, we do not make any adjustments for project-specific contractual terms and risk attributes, performance standards, or resource and raw materials risk.

Chart 3

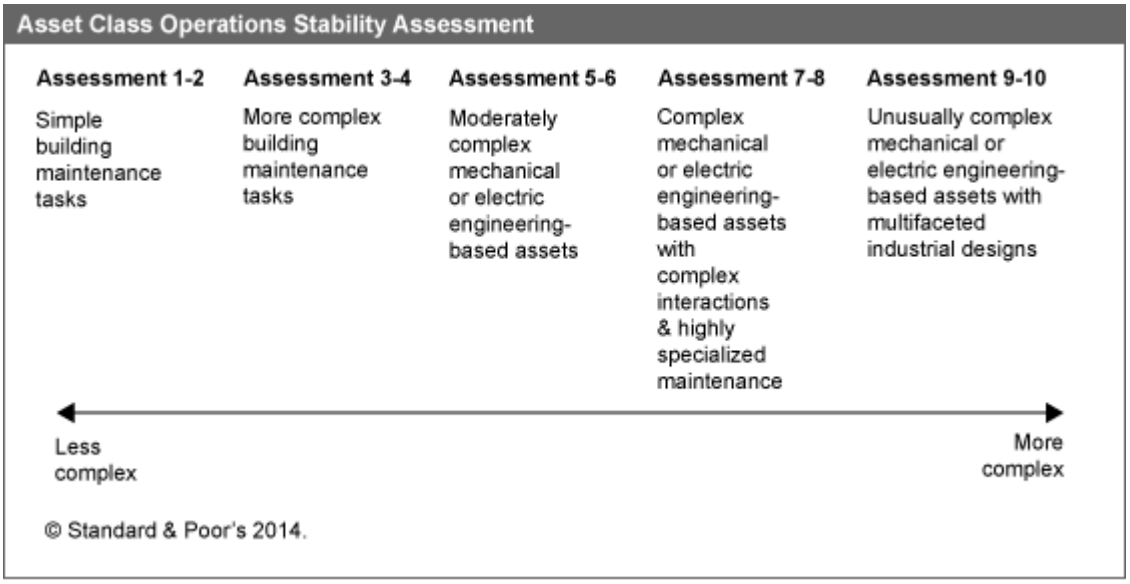

Table 2

Additional Guidance On Asset Class Operations Stability Assessment	
Asset class operations stability assessment	**Attributes**
1-2	Attributes typically include simple buildings and maintenance and facilities management services that do not require specialist skills. This lowers the risk that the projects will be unavailable to earn the expected level of cash flow due to unexpected operating underperformance. These projects have predictable and well-defined lifecycle requirements, both in terms of asset life and replacement costing, which further results in lower risk of underperformance. Schools, offices, stadium, and roads typically have service requirements, which are limited to cleaning, grounds and building, and simple structure maintenance tasks and would typically receive assessments of 1. Multistory office blocks and hotels, most hospitals, simple bridges and tunnels, and photovoltaic solar projects would typically receive assessments of 2 due to the more complex systems that require maintenance, more stringent operating requirements, or a combination of both.
3-4	Attributes typically include more challenging buildings and maintenance and facilities management services compared with assets with assessments of 1 or 2, typically because of a larger requirement for specialized maintenance skills or staff management or where simple mechanical or chemical manufacturing processes are involved. In these cases, the more sophisticated makeup typically results in more unexpected operating performance and potentially greater cash flow loss relative to assets with assessments of 1 or 2. Projects that typically would receive assessments of 3 include: hospitals that have more complex operations and maintenance compared with hospitals assessed as 1 or 2, bridges and tunnels with more complicated maintenance requirements, simple ports, pipelines with simple gas compression activities, and most transmission lines. Projects that typically would receive assessments of 4 include: simple industrial projects such as small scale ethanol production or limited scale manufacturing of simple products such as cement or solar panels, on-shore wind projects, or water ports with complex logistics activities due to their large scale or scope of operations (for example, high volume container lifting, dry and liquid product storage, and intermodal rail take-away services).
5-6	Attributes typically include moderately complex mechanical or electrical engineering-based assets involving relatively straightforward mechanical or chemical processes. Operations and maintenance generally requires advanced skills. In these cases, the additional sophistication of the assets and interlinkages typically lead to more unexpected operational underperformance and potential cash flow loss relative to assets with assessments of 3 or 4. Projects that typically would receive assessments of 5 include: multitrain liquefied natural gas (LNG) plants, relatively simple oil refineries or chemical processing plants, and many types of power stations (such as natural gas fired and hydro). Projects that typically would receive assessments of 6 include: moderately complex refineries, processing plants and certain power plants, such as supercritical coal plants, and open cut mining operations.

Table 2 (continued)

Additional Guidance On Asset Class Operations Stability Assessment	
Asset class operations stability assessment	**Attributes**
7-8	Attributes typically include mechanical or electrical engineering-based assets with complex interactions between the processes employed, and where maintenance is highly specialized and logistics failures could be material. The higher level of mechanical or electrical sophistication and interactions result in a greater uncertainty about how outages may occur and how long they last, which result in the potential for more cash flow loss than for assets with assessments of 5 or 6. Projects that typically would receive assessments of 7 include: underground mines and moderately complex chemical plants. Projects that typically would receive assessments of 8 include: nuclear power plants and complex chemical plants, especially those manufacturing very hazardous, toxic products.
9-10	Although uncommon, assessments of 9 would typically apply to unusually complex mechanical, chemical, electrical-based assets with multifaceted industrial designs. These projects tend to have a high risk of unavailability compared with our base-case expectations and often have limited historical performance data from which to forecast the level of unavailability. Projects that typically would receive assessments of 10 include: new asset classes for which industry data that support firm conclusions about long-term performance are unavailable. Examples would include proposed new nuclear plant design and technologies that lack operating history or untested, complex carbon capture technologies.

25. We typically increase the asset class operations stability assessment by one (e.g., from 4 to 5) if we are uncertain about a project's operation and maintenance profile relative to industry standards for the asset class.

b) Project-specific contractual terms and risk attributes

26. Under the criteria, the project-specific contractual terms and risk attributes assessment reflects the unique aspects of a project that make it more or less susceptible to operating breakdowns relative to what the asset class operations stability assessment would otherwise imply. The assessment comprises five subfactors: performance redundancy, operating leverage, O&M management, technological performance, and other operational risk factors.

27. The assessments for the subfactors are positive, neutral or not applicable, negative, and very negative (see table 3). In determining the range of assessments for the subfactors, we considered the types of projects we see and would expect to see, as well as the impact on the asset class operations stability assessment.

28. If we determine that any of the subfactors are not material to a project's risk profile, then we

assess it as neutral or not applicable (N/A). Any assessments of positive, negative, or very negative indicate that the project is subject to greater or less risk relative to industry peers and that such risk could have a tangible impact on operating performance. As an example, performance redundancy and operating leverage will not be relevant to most toll roads. As such, we typically assess these subfactors as neutral or N/A for this asset class.

Table 3

Range Of Assessments For Project-Specific Contractual Terms And Risk Attributes

	Positive	Neutral or not applicable (N/A)	Negative	Very negative
Performance redundancy	X	X	X	
Operating leverage	X	X	X	
O&M management	X	X	X	
Technological performance		X	X	X
Other operational risk factors		X	X	X

29. Contractual terms and project-specific risk attributes can influence the subfactor assessments (see tables 4-8). As an example, a positive O&M management assessment could result from a project having an O&M contract with an experienced third-party provider that guarantees a high level of O&M performance. We also assess the form, terms, and conditions of the guarantee and the consequences of any failure to perform its obligations, all of which should ensure that the project will maintain a high level of operating performance. In addition, a positive assessment could result if the project is responsible for its own O&M and its O&M management team has demonstrated a long track record of above-average industry performance.

30. For each subfactor, a positive assessment decreases (improves) the asset class operations stability assessment by one, a negative assessment increases (worsens) it by one, and a very negative assessment increases it by two. Regardless of the number of positive assessments, if the asset class operations stability assessment is 3 or lower, the maximum decrease is one. For assessments of 4 or higher, the maximum decrease is two. There are no limits on how much these factors can increase the resulting performance risk assessment, subject to it not exceeding 12.

31. **Subfactor 1: Performance redundancy:** This subfactor assesses whether a project has a greater or smaller likelihood of underperforming expectations because of operational redundancies (see table 4). Having several independent assets or redundant production processes can result in a positive assessment provided that the breakdown risk between the assets does not have high positive correlation. Conversely, lacking industry-standard redundancy measures can result in a negative assessment.

Table 4

Performance Redundancy	
Assessment	**Characteristics**
Positive	Projects contain several similar independent assets or there are significant redundancies in place to mitigate identified failure paths and prevent service interruptions. Typical examples would include projects that have portfolios of independent assets providing meaningful diversity and low correlation risk, such as a portfolio of five power plants of roughly the same size in different geographic regions. In addition, single asset projects can have positive assessments when there are significant redundancies in place. Examples include a single power plant with more turbines relative to industry standards, or a complex hospital that has an extensive backup power capability that virtually eliminates cash flow loss from electricity interruption in extreme outages.
Neutral or N/A	The assessment includes projects that do not meet the positive or negative categories. It encompasses single asset projects or portfolios with limited diversification. Such projects have industry-standard redundancies in place.
Negative	Projects contain predictable service or production failure paths or lack redundancies, leading to increased risk of production or service failures relative to industry norms. An example would be a complex hospital with critical patient care that lacks a backup power system that would be typical for the industry.

32. **Subfactor 2: Operating leverage:** This subfactor assesses the sensitivity of CFADS to changes in revenue (see table 5). Greater sensitivity would generally result from a ratio of fixed operating expenses and maintenance capital spending to revenue that is higher than industry peers'. Typically, a project with a positive assessment will have a lower proportion of fixed operating expenses and maintenance capital spending, meaning CFADS will decline at a slower pace under adverse conditions. For the majority of projects, we expect to assess this subfactor as neutral or N/A.

Table 5

Operating Leverage	
Assessment	**Characteristics**
Positive	The project's ratio of fixed operating expenses and routine or major maintenance expenses to revenue is significantly lower than industry peers'. For many availability projects in particular, a given percentage increase in routine maintenance expenses would result in a smaller proportional decline in cash flow available for debt service compared with industry peers. For example, a positive assessment could apply for a project that is required to construct two new buildings but is only required to provide maintenance services for one building. Another example would be a new road that is fully constructed using reinforced concrete that will need very little major maintenance over the project concession.
Neutral or N/A	The assessment includes projects that do not meet the positive or negative categories. The project would have average fixed operating expenses and routine or major maintenance expenses relative to revenue compared with industry peers'.
Negative	The project has a ratio of fixed operating expenses and routine or major maintenance expenses to revenue that is significantly higher than industry peers'. For many availability projects in particular, a given percentage increase in routine maintenance expenses would result in a larger proportion decline in cash flow available for debt service compared with industry peers. For example, this could result from a project that is required to construct one new lane alongside an existing three-lane motorway and, post construction, is required to maintain the whole road.

33. **Subfactor 3: O&M management:** This subfactor assesses the O&M provider's skill and experience level, which may mitigate or magnify potentially foreseeable operating problems (see table 6). The provider may be a third party or internal. We form our assessment based on input from independent technical experts and our own experience with the contractor and asset class.

Table 6

Operations And Maintenance (O&M) Management	
Assessment	**Characteristics**
Positive	The project contracts with an experienced and qualified third-party O&M provider that guarantees above-industry-average performance subject to material liquidated damages incentives (or potentially other incentives), where a shortfall in performance does not have any negative impact on other contracts related to performance requirements. We may also assign a positive assessment when the project's internal provider has demonstrated the ability to consistently achieve above-industry-average performance in numerous applications of the same technology, design, and general location under a variety of operating conditions. The provider employs industry's best practices and uses proactive, scheduled major maintenance cycles to extend the project's expected useful life. The project has the ability to remedy predictable failures with minimal anticipated service or production interruptions because it has spare parts on-site, has access to specialized serving equipment, or has a contract with a dedicated spare parts provider. The provider has been functioning under its own policies and procedures for many years.
Neutral or N/A	The assessment includes projects that do not meet the positive or negative categories. The project contracts with a third-party O&M provider that ensures performance in line with contractual obligations and industry standards. This assessment also applies when the project's internal provider has a track record of performing in line with general industry standards. This assessment also applies when the role of the O&M provider is not expected to be material to the project's performance and when performance requirements for full payment are easily achievable. An example would be schools or military barracks constructed under a PPP framework, where upkeep is limited to very simple operations and maintenance.
Negative	The provider has limited experience with technology, design, or location, as well as a questionable ability to meet performance requirements, or the provider has a limited track record of operating under its own policies and procedures. Project downtimes could be longer than industry norms because the project does not have spare parts that are on site or contractually available from a reliable provider for predictable failures. An example could be a sports team that plans to assume operations for the first time in a new larger stadium that has more points of sale and food and beverage concessions. Another example would be a provider experienced in operating ethanol plants that is now managing a much larger and more complex fertilizer plant.

34. **Subfactor 4: Technological performance:** This subfactor assesses the extent to which a project may face operating challenges as a result of the technology employed.

Table 7

Technological Performance	
Assessment	**Characteristics**
Neutral or N/A	For projects not yet in operations, the technology has a proven track record. There are large amounts of industry data demonstrating good operating performance for assets of a similar scale and operating under similar conditions. For operational projects, the technology has a proven track record and performed to our initial performance assessment, or may have experienced underperformance that we consider temporary. Technology assessments of weaker than neutral may be revised to neutral once the operating performance stabilizes in line with our base-case assumptions. For technology that we would otherwise assess as negative or very negative but whose risks are substantially mitigated by contractual terms, such as technology guarantees or long-term service agreements (LTSAs), we would assess as neutral.
Negative	For projects not yet in operations, the technology is proven but in a different application, arrangement, or scale. Industry data and independent expert opinions support a conclusion that the project is able to perform to industry norms at expected site conditions. An example would be a project planning to transport LNG with an untested tanker design that is based on a proven tanker design but is 30% larger. Another example would be a project planning to use onshore wind turbine--that is proven in moderate temperature climates--in a climate with harsh winters. For operational projects originally assessed as negative, the technology has performed well, and the project has been able to meet its contract specifications. However, the project's track record and operating performance remain relatively short. In some cases, historical performance may have been very negative, but we believe the past problems have been rectified or anticipated problems have not materialized, and there is now greater confidence that the technology will operate in a stable manner as originally forecast under our base case. Conversely, if technologies previously considered neutral have encountered underperformance significantly below expectations that we think will persist, we would revise the assessment to negative.
Very negative	For projects not yet in operations, a very negative assessment results if technology is new or unproven, suggesting that the project may not be able to reliably deliver contracted levels of products or services, or if evidence of operating in other applications or conversations with independent experts does not provide sufficient confidence that the technology will perform well in this application. For operational projects, the technology is performing materially below initial expectations, and we have limited confidence that technological issues will be rectified in the foreseeable future. An example would be a project converting biomass to fuel, where production is low and fuel is out-of-specification because of chemical process failures that have not been resolved despite several attempts.

35. **Subfactor 5: Other operational risk factors:** Here we assess variations from a project's expected long-term performance that subfactors 1-4 do not capture. These risks typically include labor inefficiency and unexpected frequency, duration, or magnitude of major maintenance costs. An example would be a new toll road that experiences large cracks during ramp up, requiring a potential acceleration of major maintenance costs. Contracts could mitigate some of these risks--in which case, we assess this subfactor as neutral or N/A.

36. At the onset of the operations phase, we will assess this subfactor as neutral or N/A for all projects but may revise it to negative or very negative during surveillance. Assessments other than neutral will generally be temporary. They signal that unexpected operating events have occurred or could occur, causing us to potentially revise our base-case expectations. If we later revise our base-case forecast for these reasons, we would likely revise this assessment to neutral or N/A.

Table 8

Other Operational Risk Factors

Assessment	Characteristics
Neutral or N/A	Operating performance is in line with our expectations.
Negative	Operating performance has been below expectations, which may be temporary but could cause us to lower our base-case CFADS forecast despite no changes being made to the first four subfactor assessments. Examples could be: • A hotel that had an unexpected downturn because occupancy suddenly dropped and is unable to adjust staffing levels to meet the low occupancy • A bridge that develops severe icing on its cables, changing the preventative maintenance cycles • A gas fired power plant that has more frequent starts and stops relative to our initial forecast, resulting in changes to its major maintenance costs and cycles
Very negative	Operating performance has been materially below our base-case expectations, causing us to potentially decrease, perhaps sharply, our base-case CFADS forecast despite no changes being made to the first four subfactor assessments. An example would be a processing plant that experiences an unexpected poor quality of feedstocks, resulting in frequent plant outages that continually result in lower production and unexpected repair costs.

c) Performance standards

37. A project that generates revenue through contracts can face risk if the project does not meet the minimum performance requirements specified in the various project contracts. Penalties for underperformance are also an important consideration. They can vary from a gradual reduction in revenue for underperformance to outright contract termination. Under the criteria, we adjust the performance risk assessment to reflect these relative risks (see table 9).

Table 9

Performance Standards Adjustment		
Contractual protection	**Characteristics**	**Adjustment to asset class operations stability assessment**
Above-average contract standards	The project's expected operational performance in our base case exceeds minimum contract standards with a substantial cushion that is not typical in its industry. Under our downside case, there would be no penalties for underperformance or no adverse impact under other project contracts relating to underperformance. An example would be a complex hospital that would need to experience an unusually high number of failures relative to key performance indicators before being assessed penalties. Another example would be a simple processing plant with low outage risk that receives full payment if it is 60% available, and base-case availability is expected at 95%. We would expect very few projects to receive this assessment given that we usually observe forecast and actual performance levels in line with general industry standards.	-1
Average contract standards	The project's expected operational performance in our base case exceeds minimum contract standards, and the contract terms are such that the loss of revenue for failing to meet a performance requirement is proportional to the level of underperformance of the requirement. Under our downside case, there may be modest penalties for underperformance, and there may be a modest impact related to underperformance. Contract terms are in line with industry norms and allow for a moderate level of underperformance and have reasonable provisions for planned major maintenance work. The risk of contract termination is remote. An example would be an availability road that would have to be unavailable to handle any traffic for an extended period (more than one full day in a month) before incurring any revenues penalty. Another example is a biogas plant with an industry average availability of 97% earning full cash flow so long as it is 94% available. Penalties for underperformance are linear with the level of underperformance, and termination conditions are less than 90% availability for any 18-month period.	None

Table 9 (continued)

Performance Standards Adjustment		
Contractual protection	**Characteristics**	**Adjustment to asset class operations stability assessment**
Below-average contract standards	The project's expected operational performance in our base case only modestly exceeds minimum contract standards, and contract terms are such that the loss of revenue for failing to meet a performance requirement are proportionally much greater than the level of underperformance of the requirement. Under our downside case, there is risk that significant penalties would be incurred. An example would be a desalination project expected to operate at 94% availability factor under our base-case assumptions. The contract requires 93% availability and contract terms are such that each 1% shortfall in performance below the 93% requirements results in a 3% loss of revenue. A 4% drop in the availability performance from 94% to 90% would result in a 9% reduction in revenue. Another example would be a concession transit project with rigorous on-time performance standards that is expected to perform just above contract minimum requirements and where minor underperformance occurs over a long period of time results in an accumulation of penalties that results in a large cash flow loss or termination of the concession.	+1
Weak contract standards	The project is expected to fall short of the minimum contract standards and incur material performance penalties and even have the contract terminated. We expect that this would occur rarely.	OPBA of 11 or 12

d) Resource and raw material risk

38. We may adjust the performance risk assessment for projects that require access to natural resources and raw materials to maintain service or production levels. We assess resource and raw material risk as minimal or not applicable, modest, moderate, or high (see table 10). The resource and raw materials risk reflects the potential for a project to experience a shortfall in production or service provision resulting from the lack of resources or raw materials of sufficient quality to meet our base-case projections. Examples of resources and raw materials include geothermal energy, crude oil, natural gas, wind, and iron ore.

39. Resource risk is not applicable to all projects, and we only assess it where this exposure exists. For some projects, such as real estate, toll roads, and hospitals, exposure is minimal since these projects do not rely on resources or raw materials. In these cases, we will not make an adjustment to performance risk.

40. Some projects allocate raw materials supply risk to third parties through contracts. An example would be a firm fuel transportation agreement, under which a project is ensured access to a supply pipeline and is not subject to any logistical supply issues. We examine the contract terms to determine the degree to which the counterparty is covering input supply, quality, and delivery risk, as well as analyze the residual risk in this section. If contracts effectively shield projects from

resource and raw material risk, then we assess this risk as minimal, whereas it could have been moderate or high absent the contracts.

41. In the case of renewable projects (such as wind, solar, and geothermal), physical guarantees are not possible, and few parties are willing to insure against shortfalls. In such cases, we focus on the risk of estimating the adequacy of resources over the debt tenor. Usually, an independent expert initially evaluates such resources, and we take into account actual resource performance over time and experiences from other similar projects.

42. Factors that may result in a higher level of confidence in resource estimates are:

- Evaluation by an independent expert who has many years of experience in the region of the project and who has experience in other countries with similar types of resource regimes;
- Evaluation based on many years of data at the exact project site, such as wind data at the height of the wind turbine, rather than just at the ground location of the supporting tower;
- Reevaluation of the resource periodically, especially for resources that are likely to have limited or declining reserve life, such as a geothermal resource or oil field; and
- Reliance on several completely independent resources, such as a portfolio of solar projects that rely on solar regimes that are not correlated to one another.

Table 10

Resource And Raw Materials Supply Risk Adjustment

Assessment	Characteristics	Adjustment to asset class operations stability assessment
Minimal or not applicable	Resource and raw materials of expected quality and quantity are expected to be available at all times based on contracts or redundant connectivity to deep and mature supply markets with essentially zero risk that such supply would be affected by force majeure events along any part of the delivery chain. Examples: • A contracted supply open surface coal mine that has established reserves and stockpiles large enough to cover any foreseeable interruptions • A gas processing plant in a mature gas market with access to multiple pipelines	No change
Modest	Resource and raw materials availability and quality are expected to be high based on: • Contracts with credible counterparties that have limited force majeure risk through the supply chain; • Connectivity to deep and mature supply markets with limited risk that such supply would be affected by force majeure events along any part of the delivery chain; or • High confidence in resource estimation over the debt tenor. Examples: • LNG facility or gas processing plant where there is limited risk of supply disruption that is not fully mitigated by contracts or a deep resource base with redundant pipeline connectivity • Some renewable energy projects (such as geothermal and solar) where the resource estimation is performed by a very experienced independent expert and is typically based on robust, multiyear data being available at the site level	+1
Moderate	Resources and raw materials may not be available as expected in terms of volume and quality at all times, and the risks are not adequately transferred to a qualified third party via contracts. For renewable energy projects, there is medium confidence in estimation accuracy of the resource over the debt tenor. The adjustment to the operations stability assessment will typically be +2 when potential volume variances are estimated to be 10%-20% over the long term or 20%-30% in the short term, while the adjustment will typically be +3 when such variances are estimated at 20%-30% over the long-term or 30%-40% in the short term. Examples include renewable energy projects where there is only a moderate level of confidence in the resource estimate, such as when available site-specific data is limited, or the independent expert lacks sufficient experience.	+2 to +3
High	Resource or raw materials supply is uncertain, based on the lack of contracts, weak supply infrastructure, or exposure to frequent force majeure conditions. Examples include a supply route that is exposed to a high risk of interruption (operational, cross-border geopolitical, or environmental) or has the potential for prolonged adverse weather to disrupt supply. There is low confidence in the estimation accuracy of resource. Volume variance can be significant.	At least +4, and usually resulting in an OPBA of 11 or 12

2. Market Risk

43. The criteria only analyze market risk for projects whose CFADS has the potential to drop by more than 5% from our base-case forecasted levels because of price changes or volume fluctuations or both. Market risk comprises two assessments--market exposure and competitive position--and we assess it on a 1-5 scale, with 1 indicating the lowest risk (see table 11).

Table 11

Market Risk Assessment

	--Market exposure--			
	Very low	**Low**	**Moderate**	**High**
Competitive position				
Strong	1	2	3	4
Satisfactory	1	2/3	4	5
Fair	1/2	3	4/5	5
Weak	2	3/4	5	5

Note: When two market risk assessment outcomes are listed in a given cell, a project's relative positioning within the market exposure range determines the outcome when the market exposure is low or moderate. Its relative positioning within the competitive position assessment determines the outcome when the market exposure assessment is very low.

a) Market exposure

44. Market exposure measures the expected volatility of a project's CFADS from our projected base case to the market downside case due to price changes or volume fluctuations or both. Market exposure may affect not only a project's revenue, but also its operating expenses and capital expenditures. It does not measure expected volatility resulting from performance risk. Examples of projects that have market exposure include certain toll roads or stadiums that have revenues that may change based on market demand, or power plants with CFADS that may fluctuate because of commodity prices, competition, or end-user demand.

45. We assess market exposure on a five-point scale: not applicable, very low, low, moderate, and high (see table 12). The assessment captures our expectations for the decline in CFADS from our base case to the market downside case.

Table 12

Market Exposure Assessment

Projected decline in CFADS from the base case to the market downside case (%)	**Assessment**	**Typical examples**
<5	Not applicable	Availability projects
5-15	Very low	Mature operating toll roads with traffic risk; projects with predominantly contracted revenues but a modest level of price or volume exposure
15-30	Low	Certain volume-sensitive stadiums and hotels
30-50	Moderate	Merchant power plants or gas processing plants with contracts covering a portion of expected product sales

Table 12

Market Exposure Assessment (cont.)

Projected decline in CFADS from the base case to the market downside case (%)	Assessment	Typical examples
>50	High	Projects with full exposure to volatile commodity prices, such as mines, oil refiners, and merchant power plants in volatile markets (like the U.S.)

46. The base case is our expected scenario. We will develop this scenario based on our expected view on a project's contractual performance, as well as its operational, financial, economic, industry, and project-specific conditions. This includes the impact of environmental or social credit factors, if relevant and material, on the project. For example, we may factor in the existence or the imposition of a carbon tax. Discussions with independent experts can inform the assumptions that underpin the base-case scenario. The key credit factors will provide guidance for the major industry sectors we follow. The base-case scenario factors in contracts that effectively mitigate risk for the stated minimum duration of the contract. For contracts with renewal extensions, we do not assume extension unless the project has the unilateral right to extend the contract and we conclude that the project would do so.

47. The market downside case reflects our expectations for project performance under trough market conditions, consistent with the 'BBB' stress scenario defined in our criteria (see "Understanding S&P Global Ratings' Rating Definitions," June 3, 2009). Generally, these would be the worst market conditions we would expect over a 20-year period. In the U.S., as reference, this case would generally be consistent with a GDP decline of as much as 3%, unemployment at 10%, and a drop in the stock market by up to 50%. We will typically consider trough market conditions over the past 20 years to help form our market downside case. However, this scenario may be more (or less) severe relative to historical conditions if we consider the past 20 years to have been benign (or abnormally stressful). Since our market downside is forward-looking, we may also consider structural changes in the market that could lead to trough conditions that diverge from historical examples. The key credit factors articles will provide guidance on the market downside cases. Examples of trough market conditions include:

- For commodities (such as crude oil): 20-year historical low prices, adjusted for inflation. However, if we believe there have been secular changes in the industry that have changed the marginal cost of production, we would also factor in that judgment.
- For hotels and stadiums: worst market conditions witnessed over the past 20 years.

48. We generally use a 20-year period for assessing market downside risk because this is a good proxy for projects' expected lives across many asset classes, and it would generally capture a full economic cycle. We may change this time frame if a project's expected life or debt tenor is materially longer or shorter. For example, if a project's debt matures in three years and we have a greater level of visibility on potential market volatility given our outlook on supply and demand, then we may use a more modest market downside assumption. Conversely, if a project's debt tenor and asset life extend well beyond 20 years, we will assess expected trough market conditions over that longer period, which could be harsher.

49. For fully merchant projects, market exposure will have a high correlation with the project's industry risk. However, a project's contracts or financial hedges may effectively place its market exposure anywhere along the four-point scale. Take the power sector as an example:

- A fully contracted plant with full fuel pass-through mechanisms (i.e., all fuel costs are fully

absorbed by the offtaker) that are truly effective in the jurisdiction would not be assessed for market exposure.

- A plant that has 50% of its output contracted may receive a low or moderate assessment.
- A plant that has no contracts with offtakers or hedges could be assessed as having high market exposure.

50. For certain projects, S&P Global Ratings will have limited pertinent historical data to inform its base-case and downside case forecasts. Examples include emerging asset classes with limited peers or thinly traded commodities with no reliable futures pricing. In these cases, we will use our judgment based on discussions with the project's independent engineer, if considered reliable, and our experience in analyzing projects or companies in similar industries. If we judge the independent engineer's estimate to be highly reliable, based on the amount of data used to form the estimate as well as the firm's track record in making such estimates, we will use these estimates to inform our base and market downside cases. If we consider the independent engineer's estimates potentially less reliable, we will use more conservative estimates in our base case and market downside case.

b) Competitive position

51. Competitive position encompasses project-specific business features and operating attributes that differentiate projects in the same asset class (such analysis being conducted typically to the extent the project is exposed to market risk). Projects with superior competitive position assessments are more likely to persevere through adverse industry conditions than those with worse competitive position assessments, everything else being equal. A project that faces political opposition or is contractually responsible for expenses related to climate transition risks would be less resilient than a project that is contractually shielded from such risks. We will assess competitive position on a four-point scale: strong, satisfactory, fair, and weak.

52. The following general guidance applies for assigning competitive position assessments:

- Strong: We assess a project as strong if it has superior advantages over competitors that allow for strong and sustainable profitability metrics. For commodities-based industries, these projects have first-quartile costs positions (i.e., their costs are among the lowest 25% in the industry)--after taking into account any relevant quality and geographic differentials that could affect sales price--that the projects are likely to sustain over the debt tenor. In other industries, geographic location could be the crucial factor, allowing the project to benefit from highly favorable supply and demand dynamics and creating high barriers to entry.
- Satisfactory: A project assessed as satisfactory has good comparative advantages that lead to above-average and generally sustainable profitability metrics. For commodities-based industries, these projects have second-quartile costs positions (after taking into account any relevant quality and geographic basis differentials) that the projects are likely to sustain. Geographic location may provide some advantages, allowing the project to benefit from favorable supply and demand dynamics and creating moderately high barriers to entry.
- Fair: Projects with fair competitive positions have somewhat weak comparative advantages. Profitability measures are below average or, if good, unlikely to be sustained. For commodities-based industries, these projects would only be able to survive a moderate drop in prices before reaching break-even profitability. Such projects generally face weaker supply and demand dynamics and do not enjoy high barriers to entry.
- Weak: Projects with weak competitive positions are disadvantaged relative to competitors.

Profitability measures are weak or could likely become weak. For commodities-based industries, these projects have cost positions that are broadly in line with commodity prices, and the projects would not be profitable if prices were to drop, even marginally.

53. The key credit factors articles will outline more specific criteria for determining competitive position assessments for the major asset types currently rated as project financings. Table 13 lists selected drivers of the competitive positions for projects in four sectors: power; roads, bridges, and tunnels; oil and gas; and social infrastructure, accommodation, and entertainment.

Table 13

Competitive Position	
Asset type	**Selected drivers of competitive position**
Power	• Regulatory support and predictability • Barriers to entry • Delivery cost relative to peers • Fuel supply • Transmission access
Roads, bridges, and tunnels	• Road rationale • Competitiveness • Organic growth drivers • User characteristics
Oil and gas	• Feedstock cost • Production efficiency • Geographic and/or market position • Scale, scope, and diversity • Customer mix
Social infrastructure, accommodation, and entertainment	• Market position • Market strength • The asset's condition • Pricing elasticity/sensitivity • Collocation • Marketing process • Offtaker incentives

3. Country Risk

54. Country-specific risks can influence a project's business risk. S&P Global Ratings uses country risk assessments to reflect the relative risks of operating in different countries where we rate issuers or transactions. The country risk assessments are on a 1–6 scale (strongest to weakest). These assessments reflect our view of four components: economic risk, institutional and governance effectiveness risk (includes political risks), financial system risk, and payment culture/rule-of-law risk. For more information, see "Country Risk Assessment Methodology And Assumptions," published Nov. 19, 2013.

55. For project finance transactions, we formulate an adjusted country risk assessment by

considering potential mitigants to certain risks normally captured in the country risk assessment. We then combine the adjusted country risk assessment with the preliminary OPBA to arrive at the OPBA (see table 14).

Table 14

OPBA

	--Adjusted country risk assessment--					
Preliminary OPBA	**1**	**2**	**3**	**4**	**5**	**6**
1	1	1	1	2	4	6
2	2	2	2	2	4	7
3	3	3	3	3	4	8
4	4	4	4	4	5	9
5	5	5	5	5	6	10
6	6	6	6	6	7	11
7	7	7	7	7	8	11
8	8	8	8	8	9	11
9	9	9	9	9	10	12
10	10	10	10	10	11	12
11	11	11	11	11	12	12
12	12	12	12	12	12	12

56. In some cases, a project's structure mitigates its exposure to specific country risks. If any of the three mitigants exist, as described below, and if they apply to the country risk subfactors that are considered a constraint on the overall country risk assessment, then we will reduce the country risk assessment by one (e.g., 5 to 4) to determine the adjusted country risk assessment. Otherwise, the country risk assessment is the adjusted country risk assessment.

57. Economic risk mitigants: Transferring the relevant economic and market risks fully to a counterparty could mitigate a project's economic risk. In this situation--which is uncommon--our credit assessment of the counterparty would already capture the country's relevant economic risks and, hence, would be incorporated in the project rating via the counterparty constraint.

- An example could be a power project that sells all of its electricity to a single utility. If the power purchase agreement provides that the utility purchase all the electricity produced at a fixed price and there is a full pass-through clause for all fuel costs and other variables, such as losses due to exchange rate movements, then effectively all the relevant risks are reflected in the counterparty rating.
- Most projects by their nature will not be able to completely shift economic and market risks to counterparties. Toll roads would be typical examples. Even in cases where a counterparty agrees to pay the project a flat fee regardless of traffic volumes, the projects would typically be responsible for variations in O&M expenses, thereby exposing them to the country's economic risk.

58. Institutional and governance risk mitigants: These exist only in rare instances, even if projects have political risk insurance. Institutional and governance risks are mitigated only when a project has sufficiently robust political risk insurance that addresses its most relevant political risks. Key considerations are the counterparty rating on the entity providing the insurance, the form and

terms and conditions (what is covered or excluded), the level of coverage, and the timelines of payment under the cover. We examine these considerations on a case-by-case basis. The key risks covered by political risk insurance would typically be currency transfer and inconvertibility, expropriation, war and civil disturbance, breach of contract, and arbitration and award deficits. On the other hand, we often consider "creeping" expropriation (the risk of increasing tariffs, royalties, or taxes) a key source of political risk. Political risk insurance is unlikely to cover this.

59. Financial system risk mitigants: Financial system risk could be lower for a project that exports the majority of its products overseas and has no direct exposure to a country's banking system that would affect its funding, debt servicing, cash reserves, or payment transfer from or to its key counterparties.

- An example would be an offshore crude oil production platform or a liquefied natural gas export facility that ships its output to other markets and has no reliance on a country's capital markets or banking system because it has issued fixed rate, fully amortizing debt and has established debt service reserve or other supporting reserves or instruments, such as letters of credit, that are held outside that country's jurisdiction. Payment transfers to and from key debtors and creditors would also need to be external to a country's banking system, or otherwise they would be subject to the country's financial system risk.

60. The payment culture/rule-of-law risk cannot be mitigated because projects rely on the contracts' enforceability under a country's rule of law.

61. Project finance transactions are structured to encompass a single asset or a discrete set of assets that are rarely located in more than one country. For a project finance transaction that has cross-border assets, the country risk assessment is generally based on where the project generates the largest proportion of its CFADS or where the larger portion of its cash-generating assets is located. Where relevant, however, we use a weak-link approach--meaning we apply the worst country risk assessment--even if the country generates a relatively small portion of overall CFADS. For example, if a bullet pipeline transports crude oil through three countries, we use the worst country risk assessment, even if a relatively small proportion of the assets are located in that country, because the project is fully dependent on operating in that country to generate forecasted cash flow.

B. Determining The Operations Phase SACP

62. After determining the OPBA, we then take the following steps to arrive at the operations phase SACP:

- First, we combine the OPBA with our base-case forecasted minimum DSCRs to determine the preliminary operations phase SACP.
- Second, we make several adjustments to establish the adjusted preliminary operations phase SACP. This includes adjustments based on the downside analysis, debt structure (including average DSCRs), liquidity, and refinance risk.
- Finally, we consider comparative ratings analysis and counterparty constraints to determine the operations phase SACP.

1. Preliminary Operations Phase SACP

a) Debt service coverage ratios

63. Under the criteria, the OPBA and our forecast for minimum DSCRs determine the preliminary operations phase SACP (see table 15). For non-fully amortizing projects, we will also forecast DSCRs subsequent to the original debt's maturity date until all debt has been fully repaid and will use the lower of the minimum DSCR during the initial and the post-refinance period in the table.

64. For an example of how we determine the preliminary operations phase SACP, take a project that has an OPBA of 8 and its minimum forecasted DSCR is 2.1x. In the "7-8" OPBA row of table 15, 2.1x is within the 1.75x-2.50x range, which corresponds to the 'bbb' column. Hence, the preliminary operations phase SACP is 'bbb'. If the minimum DSCR lies toward one of the endpoints in the range, the preliminary operations phase SACP will typically have a plus (+) or minus (-) sign. As an example, if two projects have an OPBA of 8 and one project has a forecasted minimum DSCR of 2.40x (at the upper end of the 1.75-2.50x range) and the other project has a forecast minimum DSCR of 1.80x (at the lower end of the range), this would likely result in a preliminary operations phase SACP of 'bbb+' for the first project and 'bbb-' for the second. Generally, we assume a project's revolving credit facilities and any discrete debt baskets (that is, the ability to issue additional debt up to a specified amount) are fully drawn when calculating DSCRs.

Table 15

Preliminary Operations Phase SACP

	--Preliminary operations phase SACP outcome in column headers--				
	--Minimum DSCR ranges shown in the cells below*--				
	aa	**a**	**bbb**	**bb**	**b**
OPBA					
1-2	=> 1.75	1.75–1.20	1.20–1.10	<1.10§	<1.10§
3-4	N/A	=> 1.40	1.40–1.20	1.20–1.10	< 1.10
5-6	N/A	=> 2.00	2.00–1.40	1.40–1.20	< 1.20
7–8	N/A	=> 2.50	2.50–1.75	1.75–1.40	< 1.40
9–10	N/A	=> 5.00	5.00–2.50	2.50–1.50	< 1.50
11-12	N/A	N/A	N/A	=> 3.00x	< 3.00

*DSCR ranges include values at the lower bound, but not the upper bound. As an example, for a range of 1.20x-1.10x, a value of 1.20x is excluded, while a value of 1.10x is included. §In determining the outcome in these cells, the key factors are typically the forecasted minimum DSCR (with at least 1.05x generally required for the 'BB' category), as well as relative break-even performance and liquidity levels. Please also refer to the FAQ at the end of this article.

65. On a given scheduled debt servicing date, the forecasted minimum DSCR may be abnormally low for a foreseeable operational reason, such as an anticipated major maintenance outage or a one-time cash tax payment. If we determine that (i) such a period is affected by a one-off event that is highly unlikely to repeat itself, (ii) it will not result in any breach of any financial covenants, and (iii) the project has dedicated and fungible liquidity sufficient to persevere through the period even under stressed conditions, then we would potentially exclude this period's DSCRs from the forecasted minimum DSCR calculation. However, if the minimum DSCR were likely to recur (for example, because of a regularly scheduled maintenance program), then we will typically include that period's DSCRs in our minimum DSCR calculation.

2. Adjusted Preliminary Operations Phase SACP

66. Where relevant, we will make a number of adjustments to the preliminary operations phase SACP, which can lead to a higher or lower adjusted preliminary operations phase SACP under the criteria. The adjustments relate to downside analysis, debt structure, liquidity, and refinance risk. However, the adjustments cannot lower the adjusted preliminary operations phase SACP below 'b-'. See paragraph 97 for when SACPs of 'ccc+' or lower apply.

a) Downside analysis

67. In the downside analysis, we assess the likelihood that a project will be able to meet its financial obligations in a downside case. We define this as the market downside case (see paragraphs 47-50), coupled with project-level operating stresses and macroeconomic and financial stresses (see paragraph 68). If the project has no market risk, then the downside case consists only of operational stresses, as well as macroeconomic and financial stresses, where appropriate. As an example, for a power project with merchant exposure, market conditions are commensurate with a 20-year trough period and it incurs moderate levels of operating stress, such as lower availability and higher operating expenses. The impact of the operational stresses will be commensurate with the project's performance risk assessment. The worse the performance risk assessment, the more vulnerable the project will be to operational stresses. Table 16 outlines the downside analysis performance expectations by rating category.

68. Macroeconomic stresses will apply in the downside analysis where relevant, and we calibrate them to be roughly commensurate with the worst conditions we would expect over a 20-year period. As an example, we generally assume materially higher interest rates for any projects with floating-rate debt as well as higher credit spreads or margins for those projects with refinancing risk. (See "Common Macroeconomic Assumptions Used In Project Financings," published Sept. 16, 2014.)

69. For projects with multiple assets, the downside analysis considers the benefit of having multiple assets, provided that we believe the performance and market risks of these assets are not highly correlated with one another. For example, if we consider an 8% availability reduction (that is, the project is unable to operate 8% of the time) as a downside case assumption for a single power plant, then a smaller availability reduction (e.g., 5%) may be warranted for a project with a number of independent power plants, given the lower probability that all plants would suffer this operational loss at the same time.

70. The downside analysis can refine the preliminary operations phase SACP if the project is more (or less) resilient to downside conditions relative to what the preliminary operations phase SACP would otherwise indicate. This could be the case for several reasons:

- Structural provisions: More (or less) restrictive structural features, such as DSCR tests permitting distributions to subordinated debt or equityholders can, if meaningfully structured, result in better (or worse) expected performance during downturn conditions.
- Liquidity: Superior fungible or dedicated liquidity, or committed unconditional and irrevocable third-party credit support may be another reason for better performance in a downside case. For example, if a project has a four-year debt service liquidity reserve, it will be more resilient than a similar one that has a one-year reserve (provided that the liquidity reserve can be used to fund losses). We factor in potential liquidity from business interruption insurance in limited situations in which we have high confidence that such proceeds would occur under probable downside conditions. Supporting factors would be that business interruption insurance is

specifically required with terms that are unambiguous, within market norms, and readily available in the market. We factor in committed unconditional and irrevocable third-party credit support when we expect such credit support to be contributed or drawn in timely manner under our downside scenario(s). (For more information on these forms of support and counterparty exposure, see "Guarantee Criteria," published Oct. 21, 2016, and "Project Finance Construction And Operations Counterparty Methodology," published Dec. 20, 2011).

- Market risk assessment: The market risk assessment can encompass broad CFADS volatility ranges, which the downside analysis can further refine. For example, if two projects have market risk assessments of "moderate" (reflecting a volatility range of 30%-50%) but one has an expected CFADS decline in a downside case (because of market risk) of 35% and the other a 45% decline, then the former could perform better under our downside case.

Table 16

Downside-Case Expectations	
Expectations for the adjusted operations phase SACP category	**Performance expectations in the downside case**
'aa' or higher	Projects in the 'aa' category should generate DSCRs above 1x under the downside case with an exceptional debt servicing cushion, supported by debt service coverage and dedicated liquidity reserves. Under our downside case, we would expect a project's DSCRs to be at least equivalent to the 'bbb' levels for a project's respective OPBA in table 15 in most circumstances. However, for projects with stronger liquidity reserves equivalent to at least one to two years of debt service coverage or 5%-10% of total project debt, the downside case DSCRs could fall to 'bb' levels for a project's respective OPBA in table 15. For OPBAs of 1-2, the DSCR threshold is typically 1.05x.
'a'	Projects in the 'a' category should generate DSCRs above 1x under the downside case with a substantial debt servicing cushion supported by debt service coverage and dedicated liquidity reserves. Under our downside case, we would expect a project's DSCRs to be at least equivalent to 'bb' levels for a project's respective OPBA in Table 15 in most circumstances. For OPBAs of 1-2, the DSCR threshold is typically 1.05x. However, for projects with stronger liquidity reserves equivalent to at least one to two years of debt service coverage or 5%-10% of total project debt, the downside case DSCRs could fall to the 'b' category for a project's respective OPBA in table 15.
'bbb'	Projects in the 'bbb' category should generate DSCRs generally above 1x under the downside case for at least a five-year period. Under our downside case, we would expect a project's DSCRs to be above 1x in the majority of cases. If it falls below 1x, we would expect liquidity reserves to be called upon to support debt service payment for at least five years and not be depleted within that period (e.g., a one-year debt service reserve fund could support five years of 0.8x DSCRs).
'bb'	There is limited confidence that projects in the 'bb' category would be able to withstand our downside case if they were to last for a five-year period. However, such projects should be able to withstand a shorter-term downside case within three to four years before depleting its liquidity reserves.
'b'	Projects in the 'b' category would likely deplete their liquidity reserves by year three under our downside case.

71. Subject to situations described in paragraph 74, based on the downside case, we will generally adjust the preliminary operations phase SACP upward by:

- One notch if the category that our downside case maps to is one higher than the preliminary operations phase SACP.
- Two notches if our downside case mapping is two or more categories higher than the

preliminary operations phase SACP.

- Potentially an additional notch for projects with liquidity levels equivalent to more than 10% of project debt. In these circumstances, in addition to what we outlined in the bullet points above, we may raise the preliminary operations phase SACP by one more notch.

72. If the category that the downside case maps to is lower than the preliminary operations phase SACP, then the downside case mapping will cap the preliminary operations phase SACP per the outcome in table 15. This approach provides for greater consistency with our "Understanding S&P Global Ratings' Rating Definitions" criteria. As a starting point, we will lower the preliminary operations phase SACP to the downside mapping without a plus (+) or minus (-) modifier. However, if the downside mapping per table 16 lies toward the upper or lower bound of the category (in terms of time frame coverage ratios or both), we may apply a plus or minus modifier. For example, if the preliminary operations phase SACP is 'bbb' and the downside case maps to the 'bb' category, then the preliminary operations phase SACP will be 'bb' unless the downside case maps to the upper or lower end of the 'bb' category, in which case the preliminary operations phase SACP will be 'bb+' or 'bb-'.

73. In modeling the downside case, we generally assume that it commences during the most vulnerable phase of a project's life. This will usually coincide with the project's weakest forecasted DSCRs. Once the downside case commences, we assume a more gradual transition to trough-like conditions for projects that have better OPBAs due to their lower cash flow volatility. For such projects, it may be more likely that certain structural features, like distribution lock-up tests, will be triggered, which enhance liquidity under the downside case. Table 17 depicts the typical transition time for projects to enter a downside scenario, depending on the operations stability and market exposure assessments. Some exceptions to this general guidance exist. In particular, availability projects, regardless of the OPBA, will usually have an immediate transition to the downside case.

Table 17

Typical Downside Case Transition Times

OPBA	Transition to downside case
1-4	3 years
5-8	2 years
9-12	1 year

74. In less frequent situations, the results of the downside analysis alone determine the adjusted operations phase SACP. If the downside analysis provides unique insight into a project's default risk that cannot be properly captured in its OPBA and the minimum base-case DSCR forecasts, it will override rather than modify the result from table 15. Such situations would typically involve projects that exhibit extremely low volatility between the base and downside case minimum forecasted DSCRs or have exceptionally robust liquidity provisions, such that we would expect--with a very high level of confidence--that they would persevere through certain downside scenarios, regardless of their base-case DSCRs.

b) Debt structure (and forecast average DSCRs)

75. In certain cases, we may lower the preliminary operations phase SACP because of the project's debt structure. Examples of when we make such adjustments include:

- Material dependence on cash flow sweeps to pay down debt under our base case.

- Excessive debt leverage (as measured by CFADS to debt or debt to EBITDA) relative to peers. This would typically occur if the project's debt tenor is materially longer than other projects with comparable OPBAs. The risk is amplified when debt maturities are close to or possibly exceed the estimated end of the project's useful life.
- Unusually high mandatory amortization payments in later years if coverage ratios are more reliant on growth assumptions.
- Relatively high exposure to inflation rate changes. Examples include availability projects (see the Glossary in "Project Finance Framework Methodology") whose debt may be indexed semiannually but revenues are indexed annually.
- Sharp changes in amortization payments designed to match forecasted uneven capital expenditures, which could be subject to change.

76. Depending on the severity of these factors, we will typically lower the preliminary operations phase SACP by at least one notch unless the preliminary operations phase SACP is already in the 'b' category or the downside case maps to a lower category and already encompasses such debt structure weaknesses.

77. In the case of debt structures with minimal amortization payments and material dependence on cash flow sweeps to repay debt under our base case, DSCRs will typically be more robust relative to fully amortizing structures. Here we will generally lower the preliminary SACP by at least two notches (excluding those projects without fixed contractual maturity dates per paragraph 96) for projects mapping to the 'bbb' category or higher, and by at least one notch for those mapping to the bb category.

78. A project's average forecasted DSCRs can also affect the preliminary operations phase SACP. When the average DSCR maps to at least one rating category higher (in table 15), then we may raise the outcome from table 15 by one notch. When calculating the average DSCR, we typically exclude any anomalously high periods. If the average DSCR maps to a higher category but is at the lower end of the designated DSCR range, then we will typically not make an adjustment. We will also not make an adjustment when we forecast a declining DSCR trajectory over the debt tenor.

c) Liquidity

79. We assess liquidity as neutral or less than adequate. In most project financings, liquidity is neutral. Debt service reserve accounts are generally sized to meet the next debt service payment (generally scheduled every six months), while major maintenance accounts are generally sized to meet any forecasted spikes in capital expenditures. For certain asset classes, stronger liquidity provisions may also be required to be a neutral consideration. The key credit factors articles will outline such cases. An example would be most volume-sensitive U.S. stadiums. These projects must generally have a one-year liquidity reserve to mitigate the risk of labor stoppages to receive a neutral liquidity assessment.

80. Under the criteria, liquidity will be less than adequate if a project does not have sufficient cash sources (cash on hand, available liquidity reserves, and forecasted CFADS) to cover forecasted debt service payments over the next 12 months by at least 1x. Most commonly, liquidity will be less than adequate if the project faces a bullet or balloon payment within the next 12 months that it has not yet refinanced. Under certain conditions, we will only include debt maturities coming due over the next nine months for the purposes of the liquidity calculation. These conditions are: the project has an operations phase SACP of at least 'bbb' and has a well-defined and credible plan to execute a refinancing within the next three months.

81.

Liquidity will also be less than adequate if financial covenants have limited headroom. For OPBAs of 5 or higher, liquidity will typically be less than adequate if a 15% decline in forecasted CFADS would lead to a covenant breach. For OPBAs of 3-4, a 10% decline would typically result in less than adequate liquidity. For OPBAs of 1-2, we typically do not assess liquidity as less than adequate because of financial covenant headroom resulting from the very high cash flow stability and compressed DSCRs under our base-case forecasts.

82. If liquidity is less than adequate, then the operations phase SACP will be no higher than 'bb+'. Depending on how vulnerable a project is to nonpayment, the SACP may be in the 'ccc' or 'cc' categories (see paragraph 97).

83. In addition, a project's preliminary operations phase SACP may capture liquidity risks since minimum forecasted DSCRs are a key driver. If, for example, we forecast the DSCR to fall below 1.2x for a project with a 5 OPBA, the preliminary operations phase SACP would likely be no higher than 'b+'.

84. While the criteria do not assess liquidity better than neutral, more robust liquidity can improve a project's risk profile during the operations phase. We would capture this improvement in our downside analysis.

d) Refinance risk

85. Project finance debt can have refinance risk. That is, forecasted CFADS and unrestricted cash on hand may not be sufficient to fully pay down debt by the scheduled maturity date. Hence, the project would need to repay the outstanding debt with cash proceeds from new bank debt or a capital markets issuance. Refinancing needs add incremental risk. Even seemingly healthy projects may fail if they face challenging capital market conditions at the time of refinance.

86. To analyze refinancing risk, we first forecast the outstanding debt balance at maturity. If the project has a mandatory cash flow sweep mechanism (see the Glossary in "Project Finance Framework Methodology"), we use our base-case forecast to determine this balance. We then forecast CFADS and a likely amortization schedule to determine the minimum forecasted DSCRs in the post-refinance period. We generally assume that the debt fully amortizes before the estimated end of the project's life subject to the following guidance:

- For OPBAs of 1-2, the debt matures one year before the estimated project's estimated end of life. For example, if a plant has an estimated life of 30 years or there is a 30-year concession, then the debt matures by year 29.
- For OPBAs of 3-4, the debt matures two years before the end of life.
- For OPBAs of 5-6, the debt matures three years before the end of life.
- For OPBAs above 6, the debt matures five years before the end of life.

87. We apply the lower of the forecasted minimum DSCRs during the initial loan period and the post-refinance period in table 15. As an example, a project has a 5 OPBA and has a 25-year estimated life and is initially financed with a seven-year term loan. During the forecasted seven-year period, the minimum DSCR is 2x. We then calculate the forecasted DSCR from year seven through year 22 (three years prior to the estimated end of the project's life per paragraph 85). In the post-refinance period, the minimum DSCR is 1.5x. For purposes of the DSCR mapping in table 15, we use 1.5x.

88. If the project's OPBA changes in the post-refinance period, we use the revised OPBA when mapping the DSCRs in the post-refinance period in table 15. In the previous example, if the project had revenue contracts that ended in year seven, then the OPBA would likely be worse in the

post-refinance period because of market risk. We would then use the worst OPBA for determining the preliminary operations phase SACP.

89. In the post-refinance period, forecasted interest rates and credit spreads can significantly affect DSCRs. In our base case, we generally assume levels commensurate with the futures curve and longer-term averages, respectively. These rates can differ materially from the initial point of financing as a result of changes in market conditions or other reasons. For example, a project that has received funding from a credit export agency on concessional terms but with no commitment of participation in the refinancing would typically see a higher cost of debt upon refinancing. As another example, a project facing growing costs related to climate transition risk or facing social pressures may also face a higher cost of debt due to a more limited set of potential investors.

90. In our downside case, we generally assume a higher interest rate and wider credit spreads. The wider credit spreads will generally be commensurate with levels that are one category worse (e.g., using 'bb' level credit spreads for a 'bbb' project). In instances where the project's downside case shows limited variability compared with the base case (which is typically evidenced by the DSCRs in the base and downside cases falling into the same category under table 15), we will typically use narrower credit spread assumptions, consistent with our base-case assumptions.

91. In addition to forecasting DSCRs, we compare the present value of future cash flows against debt levels to establish the likelihood that the project will ultimately repay its debt. This analysis is particularly relevant for projects with cash flows that are uncertain due to the level of operational or market-related risks. Depending on the project's forecasted asset coverage and stability of cash flows, this analysis will result in certain rating caps (see table 18).

Table 18

Refinance Risk Ratings Caps

	--Stability of cash flows--		
	High (OPBA 1-4)	**Medium (OPBA 5-8)**	**Low (OPBA 9-12)**
Asset coverage (PLCR)			
High (more than 3x)	None	None	None
Medium (1.5x-3.0x)	None	None	bb+ cap
Low (1.1x-1.5x)	None	bb+ cap	b+ cap
Very low (less than 1.1x)	bb+ cap	b+ cap	b- cap

92. We generally measure asset coverage as the project's forecasted project life coverage ratio (PLCR) at the point of maturity. The PLCR measures the net present value (NPV) of the project's CFADS relative to debt. In the NPV calculation, we forecast cash flows under our base case through the end of the project's life and use a discount rate commensurate with the project's cost of debt. The discount rate will generally increase with the project's OPBA and country risk and will often vary from country to country, depending on interest rates and other macroeconomic factors. For asset classes where there are liquid asset sales markets, we will also look at comparable sales multiples to supplement the NPV analysis. As an example, merchant power plants in the U.S. are frequently bought and sold, and we use value per kilowatt ratios to supplement our valuations.

93. The higher the PLCR, the greater the chances of successfully refinancing, everything else being equal. The following guidance applies to table 18:

- High asset coverage: generally above 3x
- Medium asset coverage: generally between 1.5x and 3x
- Low asset coverage: generally between 1.1x and 1.5x

- Very low asset coverage generally less than 1.1x

94. The stability of cash flow assesses the relative volatility of cash flows after refinancing. The greater the cash flow stability, the higher confidence in forecasted cash flows. The following guidance applies to table 18:

- High stability: corresponds to OPBAs of 1-4 in the post-refinance period
- Medium stability: corresponds to OPBAs of 5-8 in the post-refinance period
- Low stability: corresponds to OPBAs of 9-12 in the post-refinance period

95. For projects that have cash flow sweeps or other types of mandatory prepayment mechanisms, the forecasted debt outstanding at maturity can be materially higher under the downside case or other sensitivity analyses relative to our base-case assumptions. For these projects, we generally assess the asset coverage no better than low unless we expect the PLCR to map to a stronger category assuming minimal or modest cash flow sweep repayments.

Projects without fixed contractual maturity dates

96. Certain projects will not have fixed maturity dates and, instead, rely on other economic or operational tests to trigger debt repayment. For example, in the mining sector, project debt maturities are typically based on proven reserve levels, and the project may incorporate debt amortization triggers based on proven reserves falling below a predetermined level. In these circumstances, we forecast the DSCR until the date at which the cash flow sweep is expected to commence and use this forecasted minimum DSCR in table 15. We then calculate the PLCR at this point. Depending on the forecasted asset coverage in our base case and downside case, as well as the project's OPBA, we may then lower the project's adjusted preliminary SACP per tables 19 and 20.

Table 19

Project Asset Coverage

	--Downside case asset coverage--			
	High	**Medium**	**Low**	**Very low**
Base-case asset coverage				
High	High	High	Medium	Low*
Medium	Medium	Medium	Low	Very low
Low			Low	Very low
Very low			Very low	Very low

Note: Blank cells indicate that such combinations are highly unlikely. *If the downside asset coverage is below 1.0x in this case, then the project asset coverage will be very low.

Table 20

Potential Downward Adjustments To The Adjusted Operations Phase SACP

	--Stability of cash flow--		
	High	**Medium**	**Low**
Project asset coverage (per table 19)			
High	None	None	None

Table 20

Potential Downward Adjustments To The Adjusted Operations Phase SACP (cont.)

	--Stability of cash flow--		
	High	**Medium**	**Low**
Project asset coverage (per table 19)			
Medium	None	None	-1 notch
Low	-1 notch	-2 notches	-2 notches
Very low	-1 notch	-2 notches	-2 notches

e) SACPs in the 'ccc' or' cc' categories

97. If we view a project's capital structure as unsustainable or if it is currently vulnerable to nonpayment and depends on favorable business, financial, and economic conditions to meet the financial commitments on its obligations, then we will determine the SACP using "General Criteria: Criteria For Assigning 'CCC+', 'CCC', 'CCC-', And 'CC' Ratings," Oct. 1, 2012. Similar to structured finance, the degree of financial stress is generally the dominant factor, and the time frame for anticipated default is generally a secondary consideration when assigning a plus (+) or minus (-) sign modifier to the 'CCC' rating.

3. Final Adjustments To Arrive At The Operations Phase SACP

a) Comparable ratings analysis

98. The comparable ratings (peer) analysis refines the adjusted preliminary operations phase SACP to arrive at the operations phase SACP. We may raise or lower the adjusted preliminary operations phase SACP by one notch based on our holistic comparative analysis and our assessment of a project's credit characteristics and under- or over-performance relative to its peers.

99. Our analysis of a project's credit characteristics recognizes that a project can have material differences in key operating, financial, and structural elements relative to its peers. Examples of differentiating factors between projects include a project's relative ability to withstand stressful economic or industry environments relative to peers, including:

- Unusually strong or weak insurance policies,
- Relative stability and visibility in operating and financial performance,
- Relative likelihood of low-probability, high-risk event-related factors (in some cases referred to as tail risks; examples include operational failures, changes in political support, evolving environmental and social regulations, or a material fall-off in resource availability),
- Relative predictability of contractual regimes (i.e., the risk that the project may face contract frustration), and
- Weak subcontracting strategies or contractual structures (as a negative only).

100. Peers are generally projects in the same sector or asset class that use the same technology and, where possible, are subject to similar levels of country risk and have debt with similar tenors. Peers may also include projects occupying similar niches in different countries or projects that

can be clearly compared to make an informed comparative assessment. As an example, we may use comparative ratings analysis when there is a large number of projects in a given segment (such as power plants in the U.S.). However, we generally do not make any adjustments related to comparable ratings analysis for a first-of-a-kind project or one with a very limited set of peers.

b) Counterparty rating adjustments

101. Projects often use contracts to mitigate risk. Favorable contracts may improve a project's OPBA and, ultimately, its operations phase SACP. Such contracts also expose a project to counterparty risk. When contracts are material, a contract provider's CDA may cap the project's operation phase SACP at its CDA. See "Project Finance Construction And Operations Counterparty Methodology" for further detail. Counterparty ratings related to financial contracts may also cap the operations phase SACP if the contracts are material (see "Counterparty Risk Framework: Methodology And Assumptions").

102. In certain cases, the operations phase SACP may be higher when attributing no benefit to a contract, depending on the contract provider's CDA. If the services are widely available in the market, we may reassess the project's OPBA as if it freely transacted in the market without giving any benefit to that contract. For example:

- A favorable O&M contract results in a positive O&M management assessment, which improves the project's performance risk assessment and, in turn, its OPBA;
- The O&M contract provider's CDA is 'bb'; and
- The project's operations phase SACP is 'bbb'.

103. In this case, the O&M contract provider's CDA is below the project's SACP. We would therefore reassess the project's O&M management assessment on the basis of services available to the project un-contracted in the market. This could increase the project's performance risk and potentially result in a worse adjusted preliminary operations phase SACP relative to the initial analysis.

FREQUENTLY ASKED QUESTIONS

For projects that pay debt service more frequently than once per year, and when applying the minimum debt service cover ratio (DSCR) under table 15 above, over what time period does S&P Global Ratings typically calculate a DSCR?

As noted in the glossary in "Project Finance Framework Methodology," published Sept. 16, 2014, a DSCR is a measure of a project's financial performance for a scheduled debt servicing period that is equal to cash flow available for debt service (CFADS) divided by scheduled debt service. The time period in applying the minimum DSCR under table 15 typically covers a 12 month period. Therefore more than one scheduled debt service payment may be captured by this metric when project documents require more frequent debt service payments, for example quarterly or semiannually.

Typically, for projects that exhibit stable cash flows or DSCRs with intrayear debt servicing we would use an annual DSCR (i.e., annual CFADS divided by annual scheduled debt servicing). Mature availability based projects are examples of such projects where this approach could be

used.

For projects that exhibit material intrayear variability in cash flows or DSCRs as a result of, for example, seasonal volatility or ramp-up of operations, an annual DSCR may still be used. The use of an annual DSCR metric in this situation would typically benefit from dedicated liquidity reserves (including appropriate back-up facilities) complimented by robust cash flow lock-up tests. We would typically expect any liquidity reserved to be used to provide a cash flow cushion to compensate for such cash flow volatility and cash shortfalls in such intrayear debt service periods. Typically we would exclude debt service reserves that cover a specific period of interest and principal. In instances where a reserve may have been structured to cover both interest and principal and also provide an additional cash cushion, such as intrayear cash flow volatility, then that portion of additional liquidity would form part of our assessment in applying an annual DSCR calculation. In addition, any conditionality of the use or release of liquidity or complimentary lock-up tests would need to be taken into account in our assessment.

For projects with intrayear debt service periods that exhibit material intrayear variability in cash flows or DSCRs, and which do not have adequate dedicated liquidity reserves and complimentary lock-up tests noted above, we would typically examine intrayear DSCRs for the purpose of applying table 15.

In addition, an intrayear DSCR would typically be assessed if a particular scheduled debt service period is the major weakness under an S&P Global Ratings case. Typically, such an assessment would also consider dedicated liquidity reserves (excluding debt service reserves as noted above) and complimentary cash flow lock-up tests that we expect would act as a cushion and would be utilized to fully meet any material variability in intrayear cash flows. Again, conditionality of the use or release of liquidity or complimentary lock-up tests would form part of our assessment.

Do you include cash or liquidity balances held in reserve accounts into the calculation of cash flow available for debt service (CFADS) when calculating DSCRs?

No. As outlined in the definition of CFADS in the glossary of "Project Finance Framework Methodology," published Sept. 16, 2014, CFADS for a period is calculated strictly as operating revenues less operating and maintenance expenses. As an operating cash-flow number, CFADS excludes any cash balances that a project could draw on to service debt, such as the debt-service reserve fund or maintenance reserve fund, or cash balances that are not required to be kept in the structure.

REVISIONS AND UPDATES

This article was originally published on Sept. 16, 2014. These criteria became effective on the date of publication and superseded the articles for assessing operations phase risks in project financings (see "Updated Project Finance Summary Debt Rating Criteria," published Sept. 18, 2007) as well as several other related articles.

Changes introduced after original publication:

- We republished this article on Dec. 10, 2015, to add a section of frequently asked questions.
- Following our periodic review completed on Sept. 15, 2016, we updated contact information and criteria references and deleted outdated sections that appeared in paragraphs 3, 10, and 11, which were related to the initial publication of our criteria and no longer relevant.

- Following our periodic review completed on Sept. 14, 2017, we updated contact information and related research.
- Following our periodic review completed on Sept. 10, 2018, we updated the contact information.
- On Oct. 30, 2019, we republished this criteria article to make nonmaterial changes. We updated the contact information and criteria references.
- On Oct. 28, 2020, we republished this criteria article to make nonmaterial changes to update criteria references.
- On Oct. 11, 2021, we republished this criteria article to make nonmaterial changes. We updated paragraphs 46, 51, 89, and 99 to include examples describing how we incorporate environmental, social, and governance credit factors in our criteria framework. We also updated the "Related Publications" section.

RELATED PUBLICATIONS

Related Criteria

- Environmental, Social, And Governance Principles In Credit Ratings, Oct. 10, 2021
- Counterparty Risk Framework: Methodology And Assumptions, March 8, 2019
- Guarantee Criteria, Oct. 21, 2016
- Project Finance Framework Methodology, Sept. 16, 2014
- Project Finance Transaction Structure Methodology, Sept. 16, 2014
- Country Risk Assessment Methodology And Assumptions, Nov. 19, 2013
- Project Finance Construction Methodology, Nov. 15, 2013
- General Criteria: Criteria For Assigning 'CCC+', 'CCC', 'CCC-', And 'CC' Ratings, Oct. 1, 2012
- Project Finance Construction And Operations Counterparty Methodology, Dec. 20, 2011
- Principles Of Credit Ratings, Feb. 16, 2011

Related Research

- S&P Global Ratings Definitions, Aug. 7, 2020
- Common Macroeconomic Assumptions Used In Project Financings, Sept. 16, 2014