

Global
Master Criteria Report

Rating Criteria for Infrastructure and Project Finance

Contacts

Olivier Delfour
+33 1 44 29 91 21
olivier.delfour@fitchratings.com

Cherian George
+1 212 908 0519
cherian.george@fitchratings.com

William Streeter
+65 6796 7224
william.streeter@fitchratings.com

Dan Robertson
+44 20 7682 7381
dan.robertson@fitchratings.com

Mike McDermott
+1 212 908 0605
michael.mcdermott@fitchratings.com

Nicolas Painvin
+33 1 44 29 91 28
nicolas.painvin@fitchratings.com

Alberto J Santos
+1 212 908 0714
alberto.santos@fitchratings.com

Greg Remec
+1 312 606 2339
gregory.remec@fitchratings.com

Guillaume Langellier
+44 20 7682 7563
guillaume.langellier@fitchratings.com

Related Research

- [Country Ceilings Criteria Report \(September 2008\)](#)

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Scope and Summary

Fitch Ratings' rating approach to infrastructure and project finance debt instruments is used where repayment is dependent upon cash flows from the construction, operation and in some cases handover of a standalone project (which may encompass several project assets in different locations). Additionally, for these criteria to apply, the assets and operation of the project would be within a project vehicle or achieve an equivalent segregation of project cash flows such as a separate enterprise fund within a governmental entity; in either case referred to as a single-purpose project (SPP) in this report. Such projects typically arise in the power, transportation, telecommunications, oil and gas, industrial, mining and social infrastructure sectors.

Fitch's analysis firstly addresses the potential of the project to generate a stable cash flow based on its legal framework and fundamental economics together with any political or macroeconomic risks. The agency then considers the financial structure to form an opinion on the capacity of those cash flows to service the rated debt instruments in accordance with their terms. Some risk factors in this report may not always be applicable depending upon the nature of the project or debt instrument.

Fitch's global infrastructure and project finance ratings under these criteria are assigned to individual debt instruments and are therefore issue ratings. They take account of timeliness of payment, reflecting the instrument's terms, and do not incorporate recovery prospects given a default.

When analysing the project, a Fitch analyst will consider factors such as project rationale, the sponsor and legal structure, completion risk, technology risk, operating and maintenance risk plus risks to project gross revenue from volume, price or availability. Sovereign, political and industry risks are also considered here together with future capital expenditure and information quality. Risk allocation is a key feature of project finance and Fitch will assess its impact on the SPP, as appropriate for each risk factor, which in most cases will include a minimum level of creditworthiness consistent with the significance of the allocated risk.

The financial analysis starts on page 17 by addressing the debt structure, including priorities, amortisation, maturity, interest risk and associated hedging. The provision of liquidity, reserves, financial covenants and triggers are considered in the context of the project. Financial counterparty risk arising from off-takers, concession grantors and warranty providers as well as from pure financial transaction parties such as swap or working capital banks is assessed for its impact on the rated debt. Handover, refinance or termination risks are also considered if they apply.

Stress scenarios (single or combined factor) are used as part of the financial analysis to test the cash flow sensitivity of the rated debt instruments against a range of possible outcomes for key rating drivers. Ultimately, rating scenarios (see page 21) are established to assess the level of stress an instrument might reasonably survive. If possible, some characteristics and metrics of the project are compared with peer transactions to ensure consistency (page 23).

Investment-grade ratings are typically associated with projects, structures and instruments displaying predominantly stronger or midrange attributes described in this report. The ranking of attributes in this report represent Fitch's analytical

views from a wide range of project types. The lists are not exhaustive and some attributes may be interchangeable or may simply not be relevant in a specific project. Also the same attribute may be stronger for one factor and weaker for another. The attribute tables are not checklists but qualitative guidance in assessing the attributes present in a project and are only part of the rating process.

This generic infrastructure and project finance criteria report is used by Fitch analysts in conjunction with any relevant project sector or asset class-specific criteria. Sector or asset specific criteria may provide indicative metrics and stress levels, additional factors, attribute expectations or specific methodologies.

Structure and Information

Ownership and Sponsors

The quality of owners or sponsors is an important consideration when assessing the potential success of a project. Strong sponsors have significant positive experience within their own markets and internationally. Prior experience in the region and country in which the project is located is desirable. Fitch looks for previous involvement with similar projects that have been developed and operated successfully. The project sponsors should be able to demonstrate past experience with the technology and market. The involvement of local parties is considered to be advantageous, as they may be more knowledgeable of and responsive to the business and political environments within the country. In some cases, sponsors may be public entities or agencies, in which case other factors may prevail (for example, such sponsors would rarely have international expertise but may be in close control of political and regulatory aspects).

Sponsors or owners should also be able to present a viable project rationale, typically based on commercial feasibility or social need.

The agency also considers the ownership structure and its complexity, relationships with contractors, whether there are multiple owners, the potential for change of ownership and the flexibility to resolve project issues. The alignment of interests between owners, contractors and lenders is reviewed for obvious conflicts in adverse circumstances and contract negotiation.

Fitch looks for evidence of the sponsors' commitment to the project. Sponsors with significant resources, time and reputation invested in the project, including higher levels of direct equity investment or guarantees combined with covenants to retain adequate capitalisation or public service focus are considered a stabilising factor. The strategic importance of the project to the sponsor is considered. For example, the sponsor's performance on a high-profile project may heavily influence the chances for subsequent business within a country or region and their reputation in general. In this regard, governments and trade owners or sponsors are usually better incentivised than financial parties.

Sponsors without operational resources or capacity for technical support are unlikely to be ascribed any rating benefit regardless of financial strength. Fitch assesses the financial strength of sponsors or external support to meet financial obligations as part of its financial analysis (starting on page 17). In any case, unless there are contractual guarantees, Fitch will not assume that sponsors will systematically provide financial support in a timely manner to honour project company's financial obligations.

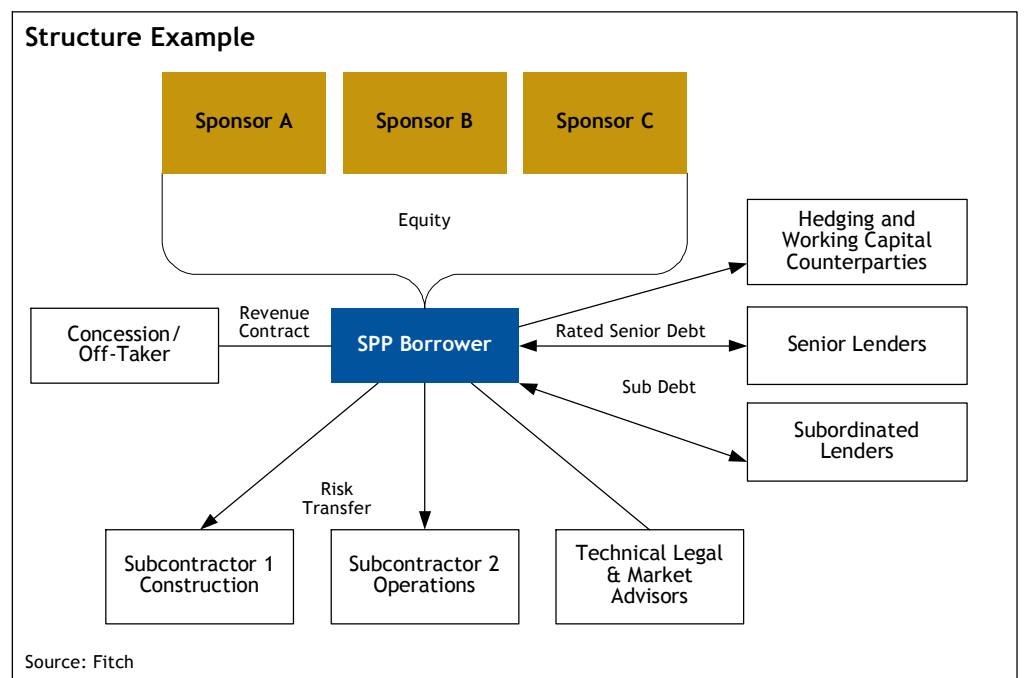
Stronger attributes	Market leading "trade" owner/sponsor; deep experience of similar projects; equity contribution before debt; parent support if associated with contractors; history of support for investments; project vehicle is subsidiary of strong sponsor; essential public service sponsored by central government; minimum ownership and change of control covenants through debt life; "long-term" business model.
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Midrange attributes	Experienced financial and trade owner/sponsors; equity commitment guaranteed; arms length construction/facilities management contacts; ownership via intermediate holding company; active municipal or government sponsor; minimum ownership and change of control covenants in key risk phases; government commitment in national strategic projects.
Weaker attributes	Three or more owner sponsors without previous successful cooperation; no “majority/controlling” owner/sponsor; inexperienced or minor trade or financial sponsors; borrowed/leveraged equity; no contract tendering; multi-layer ownership structure; non-essential public service with minority small municipal sponsor; weak or no minimum ownership and change of control covenants; speculative or “short-term” business model.

Project Vehicle Status and Project Structure

As described in the *Scope and Summary* section, Fitch’s infrastructure and project finance criteria assume the existence of a project vehicle or equivalent means of segregation, the SPP, to ring-fence the assets and operation of the project and hence the cash flows, which are the repayment source of the rated debt instruments. Similar ratings may be achieved using a project vehicle, through specific legal frameworks without the existence of a project vehicle (as would be the case for transportation revenue bonds in the US for instance) or by contractual structural features.

This part of the analysis is undertaken to establish the degree to which factors other than the economic success of the project might impact the project cash flows. Fitch would expect key contracts to be in the name of the project vehicle or for the sole benefit of the segregated project. However, the operational role of the SPP is reviewed to consider what liabilities it might incur through employees, trade debt, taxation, environmental and operational risks, etc and to what extent these are sub-contracted or mitigated. The SPP would also be expected to have corporate or statutory objects limited to supporting the single purpose of the project and other provisions de-linking its operations and finance from that of any owner or sponsor or public entity. Where the SPP has more than one class of debt, a comprehensive inter-creditor agreement is anticipated possibly in association with non-recourse and non-petition language. This may encompass working capital facilities or use of reserves intended to smooth variations in net cash flow.



In some instances, the SPP may not be the issuer (or borrower) of the rated debt but financed via a so-called “bankruptcy remote” special-purpose vehicle (SPV) that issues rated debt and on-lends to the project (SPP).

Stronger attributes	Borrower/issuer secured loan structure; bankruptcy-remote issuer with own liquidity/hedging; comprehensive inter-creditor arrangements at borrower level; de-linked from parent or group; clear single-purpose objects; limited or no operational activities; “non-recourse”/“non-petition” debt.
Midrange attributes	Rated debt at project level but to SPP; comprehensive restrictive covenants; inter-creditor agreement; financially and operationally de-linked from parent; contracts in the name of the SPP; “non-recourse” debt; separate financial statements; some structural complexity, eg intermediate holding/JV company.
Weaker attributes	Weak restrictive covenants and inter-creditor arrangements; rated debt at project level and borrower is not an effective SPP; financial and operational links to parent; project vehicle is not primary contracting party; complex borrowing structure; complex structure, eg intermediate holding companies.

Jurisdiction and Other Legal

Forming an opinion of the quality of the legal framework upon which many project assumptions rest is a prerequisite to the credit analysis. For instance, this may be purely contractual or rely on statute or codified law or a particular statutory instrument or the powers of a constitutional or statutory authority. In assessing the robustness of a framework, Fitch analysts consider the country of operation (often the location of capital assets) and the country of incorporation of the project vehicle, issuer and other key parties together with the reliability and creditor orientation of their legal systems. The project contract suite (and if appropriate, any legislation it may depend on) or detailed summary documents (such as a prospectus) are reviewed for key commercial elements and conformity to general market standards. Fitch analysts will look for contract clarity, especially regarding allocation or transfer of risk within the project structure. Where the project requires that the contracting parties hold licences, permits or regulated status, Fitch will assume (unless otherwise stated in its issue report) that all relevant licences, permits or regulated status have been obtained and are valid under all relevant laws. The agency will also analyse the risk of loss of or renewal of such licences, permits or regulated status within the particular jurisdiction. More importantly, analysts will form a view on the clarity of the legislation and/or regulation, the stability of the regulatory environment and any impact this may have on project performance or dispute resolution. Other matters such as independence of an SPV issuer, collateral rights or statutory ownership restrictions will be reviewed on a project by project basis. Fitch will rely in its credit analysis upon legal opinions to the extent that they are provided to it by transaction counsel, legal precedent that the agency is aware of and/or statements by regulators or governments.

Stronger attributes	Operation and incorporation in country with creditor friendly, reliable and independent legal system; structure based on standard contracts or specific legislation supported by legal opinions; allocation of project and financial risk unambiguously evidenced by contracts; all relevant licences, permits or regulated status have been obtained and are valid to debt maturity; low structural complexity; legal framework includes financial rebalancing mechanisms in case of unforeseen events; strong track record of quick and fair resolution of litigation.
Midrange attributes	Country of operation or incorporation has reliable legal system with reasonable precedent; legal opinions or strong precedent for key contracts; all relevant licences, permits or regulated status have been obtained and are valid and are likely to be retained and remain valid; risk allocation clear but may have performance conditions.

Weaker attributes	Country of operation or incorporation has legal system lacking precedent or independence; project is dependent upon untested legislation or regulation; weak or no legal opinions; contracts not available for inspection; all relevant licences, permits or regulated status have not been obtained or are not valid.
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Use of Expert Reports

The information provided to Fitch may contain reports, forecasts or opinions provided to the issuer or their agents by various experts. These include legal advisors, independent engineers, traffic, market or environmental consultants, insurance advisors and others. Where these reports contain matters of fact, Fitch assumes these are reliable. Where the information is a forecast or opinion, Fitch expects these to be based on well reasoned analysis supported by the facts. The status of the expert will also be considered in determining what reliance may be placed on their forecasts or opinions. Factors such as experience in the jurisdiction, location or terrain, experience with the technology or transaction type and formal qualification or licensing are often relevant. The importance placed on these factors is directly related to the materiality of the expert's forecast or opinion for Fitch's rating opinion.

When forming its rating opinion, Fitch may place less reliance on expert reports that lack clarity or contain extensive caveats or were conducted under less relevant circumstances. If possible, reports are compared with similar reports to highlight unusual or optimistic features. Without good rationale, such features may lead to adjustments in Fitch's financial analysis. The agency expects experts to conduct their reports to professional standards and avoid conflicts of interest.

The degree to which Fitch uses expert information will depend partly upon the above issues and on the relevance of the information to the identified key risks. Where available expert information does not address a material issue, but might be expected to, Fitch may make a further information request or an appropriate assumption.

Stronger attributes	Independent, major, specialised advisor; specific experience with technology or sector, jurisdiction and location; projections and estimates based on tested or proven operation or precedent; no material unsupported assumptions; report demonstrates analytical rigour.
Midrange attributes	Independent, major advisor experienced with similar technology or sector; advisor may not have experience of location; advisor may be regional specialist familiar with the technology; estimates based on short operating history and/or rich industry data; some dependence on reasonable assumptions; formally qualified or licensed where required (eg under the local law).
Weaker attributes	Smaller or less experienced advisor; innovative technology or new sector; estimate data sourced from manufacturer or highly model dependent; high dependence on assumptions or sponsor estimates; report contains incomplete or limited reasoned analysis.

Information Quality

The quality of information, both quantitative and qualitative, can be a constraining factor for ratings. Information quality may constrain the rating category to some maximum level or in extreme cases preclude the assignment of a rating opinion. Information quality for the initial rating and for surveillance purposes is considered when a project finance rating is first assigned. Fitch must be confident that adequate ongoing data will be available to monitor and maintain a rating once assigned. Information quality encompasses such factors as timeliness and frequency, reliability, level of detail, independence and scope. (see also *Models* and *Surveillance*).

Stronger attributes	Data from actual operation; high frequency data; independently validated; forecast supported by significance or error range statistic; no history of material data errors; detailed cash flows - receipts and disbursements; audited financial data; significant amount of public information available.
Midrange attributes	Combination of empirical and forecast; use of pilot studies, analogous projects in operation, tested equipment performance; timely receipt of data; periodic cash flows; timely notification of material events; actual counterparty exposures; regularly updated financial model.
Weaker attributes	Substantially based on assumptions; extrapolated; subject to material caveats; data often subject to delay; history of revisions or errors; limited scope.

Completion Risk

Fitch routinely rates so-called “greenfield” projects before they are fully developed. Such ratings will therefore encompass the construction and ramp-up, which are often the periods of greatest risk in a project. Completion risk covers the risks in the construction, commissioning and ramp-up phases of a project that may cause the project not to be completed on time, on budget and/or up to the performance standards assumed for the operating period credit profile. The likelihood of these events occurring and their potential consequences are assessed. Completion risk is more likely to materialise as a weaker operating period credit profile, rather than an unfinished project. In reviewing these risks, Fitch considers the following factors: the contractors, cost structure, delay risk, technology risk and other terms of the construction phase contracts. Importantly, many of these risks can be partially offset if the project has existing operating components that generate sufficient cash flow to deal with such risks.

Contractors

The experience and credit quality of the main contractors in the construction is reviewed. Fitch expects a good record of completing projects on time, on budget and up to the required standards. Multinational scale operating capacity (for large projects), previous experience with the technology and type of project plus experience in the country where the project is located are desirable. Generally, Fitch considers the involvement of local partners, subcontractors and/or suppliers to be advantageous based on their local business and political experience. Contractors should be able to draw on a sufficient base of skilled and unskilled labour, local or expatriate, and have a history of stable labour relations. The contractor’s relationship with other transaction parties is reviewed for potential conflicts or incentives. The availability of suitable replacement contractors and contractual provisions to effect a replacement are considered. The financial health of the contractors is assessed (see *Project Counterparty Risk* on page 22). This is done to assess whether construction contractors have the necessary resources to overcome cost overruns, delays, etc and bring the project into operation or to meet any other obligations to the project. Contractors may be required by the SPP to post performance bonds or completion guarantees (see *Financial Counterparty Risk* on page 23), usually in favour of the SPP and often assigned to debt holders (see *Security Package* section on page 19).

Stronger attributes	International engineering, procurement and construction (EPC) contractor; potential replacement contractors; strong labour market; direct experience of similar projects; involvement of major local contractor; investment grade; comprehensive performance guarantees; renegotiation period adequate to replace contractor.
Midrange attributes	Experienced contractor; part of larger group, possibly investment grade; involvement of local contractors; material performance guarantees.
Weaker attributes	Smaller or less experienced contractor; multiple sub-contractors; financially weak; no external financial support.

Cost Structure

The risk that the construction costs will be greater than budgeted and the effect this could have on the ability of the project to make debt service payments are analysed. Fitch looks at the allocation and determination of costs within the contracts; in particular, under what circumstances the contract price can be increased. The agency expects risks within a project to be allocated to the parties best able to control them. Contractors are typically best able to manage direct construction cost, therefore fixed-price turnkey contracts provide significant motivation for the contractors to be on or under budget. However, this benefit of fixed-price turnkey contracts depends on the strengths of the contractors and their willingness to deliver on their obligations. The construction budget is also reviewed. Even with fixed-price turnkey contracts, it is important that the budgeted cost of the project is reasonable and achievable. To determine the reasonableness of the budget, the cost of the project is compared with similar projects when possible, as well as available information on other contractors' pricing for the same project. Unique features of the project, such as difficult terrain, are considered in this analysis. The adequacy of contingencies is also reviewed. Given the technical and specific nature of all the points mentioned above, Fitch prefers that an independent expert has reviewed the cost budget and provided conclusions as to its competitiveness and achievability.

Stronger attributes	Fixed-price contract with creditworthy contractor; cost risk appropriately allocated; cost risk hedged without material basis or counterparty risk; adequate contingencies in cost budgets; committed funding incorporates contingencies; costed on detailed upfront designs.
Midrange attributes	Fixed price contract priced to industry benchmarks; adequate completion guarantees and liquidated damage provisions; cost risk partially hedged or transferred to suppliers.
Weaker attributes	Project vehicle materially exposed to cost risk; weak completion guarantees and liquidated damage provisions.

Delay Risk

Fitch reviews factors that could delay scheduled completion of the project, including the strengths and experience of the contractors, the length of the projected construction period, the availability of building materials and supplies, the terrain over which the project is being constructed, the risk of not receiving permits as and when required, the exposure to labour problems, connecting infrastructure, dispute resolution and political risks. Many of these factors also have cost and performance implications and are discussed elsewhere (eg contractors, technology, dispute resolution). Delay risk will vary with the stage of the project and the length of the projected construction period. Longer construction periods are generally considered more risky but significant construction already completed can act as a mitigant. Projects may be delayed because of the inability to receive materials and supplies on time, particularly when they have to be imported. An assessment of this risk includes the capacity of the suppliers, transport infrastructure, terrain, and climate. Difficult terrain and unpredictable climate may also increase delay risk on actual construction absent adequate contingencies. Political instability can impact project schedules through issues such as physical security and receipt of permits. National interest, environmental or safety issues and public opposition can also delay or modify consents even in more stable political environments. Where such issues are identified, Fitch will consider the capacity of the project schedule to accommodate related delays or to obtain compensation from responsible parties. The potential for schedule delays due to problems with supply and reliability of labour are considered. Dependence upon foreign workers, prevalence of disputes and the working environment can be factors here.

The independent engineer should have reviewed the construction schedule and commented on its attainability. Fitch reviews the analysis and conclusions of the independent engineer when assessing the delay risk.

Financial mitigants for delay risk (such as liquidity and reserves) are discussed in the *Debt Structure* section (page 17).

Stronger attributes	Extensive completion guarantees and liquidated damage provisions; step-in rights; all permits etc in place; “long stop” adequate to replace contractor; generous project schedule; contingencies for unexpected delays; little ground for public opposition; major parties have history of on-time completion.
Midrange attributes	Adequate completion guarantees and liquidated damage provisions; permits granted - some minor costed conditions may exist; reasonable project schedule.
Weaker attributes	Weak completion guarantees and liquidated damage provisions; clear potential for delay; permits outstanding; dependence on political will; ambitious project schedule; key party has history of delays.

Contract Terms

As well as the aspects of the contracts discussed above, where available Fitch reviews material construction phase contracts for factors that may impact the service of rated debt. The agency’s expectation is for contracts that are standard for the practice in that sector, reflecting the particular risks of that sector and the stated aims and scope of the project. Specific sector issues are discussed in dedicated criteria reports or in issue reports. Some generic factors are discussed below. The agency may not have access to certain contracts or may rely on summary information or responses to questions from issuers and their expert advisors. Issues raised in this section that extend to the operating phase will also be considered in that context.

Where a contract transfers risk away from the SPP to another party, the rating will only benefit when that party has adequate capacity to absorb the risk (see *Counterparty Risk* on page 22).

Retentions, penalty payments, long-stop dates and liquidated damages if the project is not completed on time, on budget or to the required performance standards, would usually be a feature of projects supporting investment-grade debt. Penalty clauses should ensure that any such costs or payments incurred by the SPP under the project agreements are passed on to the responsible party. Penalty payments should compensate for lost revenue or increased costs sufficient to maintain debt service under stress scenarios commensurate with the rating. Fitch may assume delays in receipt and less than full payment in its analysis. Penalty payments subject to complex conditions or deferred payment are unlikely to benefit a rating. Similarly, bonus payments would not necessarily benefit the rating but would be considered a budgeted cost. Long-stop dates permitting renegotiation, typically in the range of six to 24 months after scheduled completion, would be expected.

Dispute resolution mechanisms in contracts, regulatory approvals or statutes are expected to provide a reliable forum and a clear mechanism should a dispute arise. Generally, this means that dispute resolution should be governed by internationally recognised standards. Of particular concern is the potential impact on the cash flows of a dispute that is not resolved quickly, resulting in delays and cost overruns.

Insurance should be in place to cover a range of insurable project risks, ideally consistent with the report of an independent insurance expert; liability, casualty and business continuity insurance are typically included and should cover hurricane, flood or seismic risk where appropriate. The expectation is that casualty insurance

will be “total loss” maintained on a continuing basis. The involvement of the insurer’s loss engineers from the outset helps determine appropriate cover and potentially speeds up claims. In some cases, insurance proceeds may have no impact on default ratings but only influence recovery prospects. The rights to insurance proceeds and the party responsible for insuring would normally be established.

Force majeure risks or “acts of nature” outside the control of the project parties are not factored into the rating analysis. A force majeure clause typically relieves or suspends the obligation of a party when they are unable to perform the obligation due to a force majeure event. To the extent force majeure clauses deviate from industry standards, Fitch considers whether its analysis should incorporate additional risk factors.

On-site inspection terms should provide a regime ensuring that construction and major maintenance are well managed, and independently monitored. Cost, quality and time schedule targets should be reported, enabling the risks to be tracked. Fitch expects to receive copies of such reports on a periodic basis. Progress payments released from a trust against the certificate of an independent engineer is seen as a benchmark protection for debt holders. However, other mechanisms perhaps involving external financial support, and associated counterparty risk, may provide a similar level of reassurance. Equally, over-complicated or rigid mechanisms may have unintended adverse effects.

Connecting infrastructure is expected to be contracted such that delay, cost or performance risks to the project are minimised. Connecting infrastructure may be built by the project or by third parties or provided by connection to existing networks. Where non-availability is a risk to project cash flows, Fitch will consider key connecting infrastructure using the same factors and approach as for the main project. Fitch expects that the contracts for the connecting infrastructure are generally well aligned with the main project.

Stronger attributes	Comprehensive, best practice contract suite; extensive completion guarantees and liquidated damage provisions; clear, binding and standard dispute resolution process; insurance consistent with independent report; regular on-site inspection and detailed reporting; no connecting infrastructure risk.
Midrange attributes	Clear and comprehensive contracts to industry standards; adequate completion guarantees and liquidated damage provisions; dispute resolution process in place; industry standard insurance package; connecting infrastructure contracted; on-site inspection and exception reporting.
Weaker attributes	Complex or incomplete contract suite; multiple sub-contractors without liability of the EPC provider; weak completion guarantees and liquidated damage provisions; high penalties for the SPP; no dispute resolution process; self-insured or under-insured risks; reliance on local or minor insurers; connecting infrastructure not contracted; no provision for on-site inspection and reporting.

Technology Risk

Technology risk in the construction phase may contribute to delays (see above) or lower performance leading to lower operational cash flows. The completion risk for projects that make use of conventional proven technology is considered lower, particularly if proven in similar terrain, climate and scale. Technical complexity is considered a risk factor, including connecting infrastructure, whether proven or not. Where technical performance relies on assumptions or manufacturers’ claims, Fitch typically places more reliance on the opinions of the independent engineer. Manufacturer involvement, either operationally or through warranties, can be a positive, particularly if supported by appropriate financial capacity. Contractors’ experience and ability to source skilled labour (discussed above) may be more

important where technology risk is higher. Where contractors provide warranties for the performance of the project, the length of the warranty period should be commensurate with the technical risks and the warranty period should not begin until the project has met satisfactory completion testing.

Prior to commissioning and ramp-up (period required to reach long-term average production, availability or usage), Fitch would expect the independent engineer to confirm that the project had been completed to the required standards (typically recognised international standards) on the basis of a reasonable completion test. Where possible, Fitch compares modelled performance, contractor guarantees and manufacturer's specifications with the engineer's reports. Adequate commissioning and ramp-up time consistent with the technical risk is expected.

Stronger attributes	Well-tested equipment installed in similar terrain/climate; contractor experienced with technology; continuous support by manufacturer; manufacturer-supervised commissioning and ramp-up; major manufacturer; low technical complexity (eg social infrastructure, wind farms).
Midrange attributes	Manufacturer support; adequate testing period based on similar projects; modified technology; established manufacturer; possibility of delay but within stresses; medium technical complexity (eg roads, traditional power plant).
Weaker attributes	Innovative technology or in new terrain; smaller or newer manufacturer; technical report with caveats; history of problems; less experienced contractor; onerous handover terms with clear potential for delay; minimal or no manufacturer support; high technical or logistical complexity (eg refineries, major rail).

Operation Risk

Operation risk is the risk that the project will suffer a reduction in availability, productivity or output or, alternatively, the project will incur costs that are greater than projected after completion. Either of these may result in a reduction in projected cash flows or breach contractual performance requirements and therefore impair the ability of the project to service its debt. These risks are reviewed to assess the likelihood of the events occurring and the consequences if they do. The extent and nature of the risks vary by project sector (asset class) but maintenance is a key factor for output, availability and cost. The analysis of operation risk focuses on the ability and financial health of the operator, the cost structure and the supply risk. Analogous contract risks, discussed in the *Completion Risk* section above, are considered again for the operation phase.

Operator

The ability to operate the project efficiently and effectively is usually evidenced by past experience with the same type of project and technology, ideally in the same country or region, together with adequate resources, including relevant qualified staff. Although these are similar factors to those for construction contractors, contract periods are typically much longer with a wide range of complexity between projects from smaller, basic availability schemes to technically advanced, market exposed large-scale projects. Fitch would expect the operator's compensation to reflect the risks and performance standards of the contract, allowing a reasonable prospect of absorbing the risks and achieving the standards. Contracts that appear under-priced may be considered credit negative if, for example, this might lead to delay or reduced expenditure on repairs and maintenance. Achievable performance-based measures (either penalties or bonuses) may be considered credit positive if they provide an incentive to achieve or surpass projected performance. Penalties should be proportionate and ideally cover lost revenues that result from substandard performance by the operator and bonuses should be fully costed. The operating and maintenance contract should provide a clear mechanism for dispute resolution, avoiding interruption of cash flow for rated debt service.

Fitch assesses the performance risk based on the operator’s track record, independent engineering reports, peer analysis, operating complexity and contractual/structural flexibility. Grace periods, flexible maintenance schedules and other such features may act as mitigants. However, onerous terms such as challenging deadlines or concession termination rather than financial penalties may preclude a debt rating.

The reputational importance for the operator of a high profile project either in respect of technology, scale or national prestige may add an incentive but is unlikely to benefit the rating in isolation. An operator may also be a sponsor or constructor of the project or have some other interest. In this case, both incentives and possible conflicts are considered; however, the key rating issue is an alignment of interest with the rated debt holders.

The operator’s financial position is considered to the extent that it might constrain its ability to operate the facility throughout the life of the debt (performance risk). Where this is judged to be a material factor, it is likely to constrain the rating. The materiality of this risk will also depend upon the availability of a replacement operator or other contract party; factors such as specialist skills, size of project and location, as well as contractual remuneration, can determine this. Projects are typically exposed to their operators for a long period, raising risk and the importance of an available replacement. Replacement of an operation and maintenance contract that was not originally “arms length” may incur additional cost or negotiation, particularly if the operator is affiliated to other project parties. To what extent the SPP or noteholders have rights to replace an operator and the related timing to do this is also considered. Where an operator has assumed the obligation to absorb cost increases or provided other financial protection, its financial capacity may be examined more specifically and will potentially have a significant impact on the rating (see *Project Counterparty Risk* on page 22).

Stronger attributes	Extensive experience with similar projects; international reach with local experience; multiple alternative operators available; strong financial position; project is a “landmark” for the operator.
Midrange attributes	Experienced operator; part of larger group; alternative operators available; stable financial profile; local experience; market-based compensation.
Weaker attributes	Financially weak operator with few or no alternative operators available; limited to no experience in sector; unclear replacement provisions; uneconomic contract; non arms-length transaction; poor reputation; limited “in-house” resources.

Costs

Fitch reviews the makeup, timing and potential volatility of operating costs. Operating costs vary by project but generally will include some combination of the following: commodities and utilities, labour, taxes, insurance, maintenance and capital expenditure or “lifecycle” costs. In contrast to the construction phase, the operating phase may have a high component of cost that is variable (passed through to revenues), thus reducing operating leverage, which is seen as positive. The exposure of the project to unanticipated operating costs is reviewed and reflected in the stresses in the cash flow analysis. Cost mitigation through risk transfer to strong sub-contractors or suppliers (see below), inflation based contracts, cost-plus contracts and the like may often be rating positive. Fitch prefers to have independent reports available when assessing future capital expenditure or lifecycle costs, both for timing and quantum.

Stronger attributes	Well-identified cost drivers; pass through of costs to financially strong entities; flexibility in timing for major costs (lifecycle); generous provisions for cost variations; costs well spread over time; highly predictable/contracted cost profile; strong ability to vary cost with demand; not capex intensive; low maintenance cost profile; costs substantially recoverable under concession or framework contract; reserves cover contingent costs.
Midrange attributes	Predictable cost profile; ability to vary marginal cost with demand; material capex; cost increases reflected in regular revenue adjustments (benchmarking or market testing) with transparent methodology; well-identified cost structure dynamics.
Weaker attributes	High sensitivity of project cash flows to the timing of costs; lumpy cost structure; volatile cost profile (labour/energy/technology); history or risk of labour disputes; highly capex intensive; high maintenance cost profile; no cost pass through; weak or no operating reserves.

Supply Risk

Some projects require that a resource or product exist or be available in order for the project to operate. This resource or product can take many different forms. The supply risk is the risk that these resources or products are not available in sufficient quantities and/or at prices that allow the project to operate as projected. In projects that involve the extraction of a resource or commodity, an assessment of the supply risk will involve a determination of the sufficiency of reserves and the cost of extracting them. Fitch expects a study by an independent expert addressing these issues. If the resource or product is being supplied to run the project, the agency considers the availability of the resource or product. Typically, liquid markets should exist for required commodities, but Fitch considers the potential for temporary supply constraints rather than long-term availability deficits. This includes an analysis of the price at which a substitute resource or product is available. In projects where this type of supply risk is high, Fitch may stress the cost of a volatile commodity. Supply risk may be mitigated by long-term supply contracts. These contracts may fix the volume and/or price at which the resource or product is supplied.

The importance of fixing the price at which the resource or product is supplied depends on the volatility of the price of the product and how the off-take price is determined. Where input cost increases could make the project's output uneconomical, fixing supply costs is a desirable mitigant. However, if the resource or product represents a pass-through cost in determining the revenue of the project, then generally fixing the price of the input is not as important except when reduced off-take volume may result. Fitch also examines how the product or resource is supplied to the project, especially in terms of connecting infrastructure or availability of reliable alternative supply routes. The credit quality of any party involved in supplying the resource or product is assessed. If they are not strong credits, the availability of back-up suppliers may be an effective mitigant.

Stronger attributes	No supply constraints for labour or materials; long-term supply contracts; excellent transportation/utility infrastructure; connecting infrastructure in place - alternatives exist; commoditised nature of key supplies; low or no exposure to input costs; sufficient independently verified reserves.
Midrange attributes	Adequate supply of materials and labour with limited volatility (amount and timing); good transportation/utility infrastructure; connecting infrastructure in place - limited alternatives.
Weaker attributes	Potential for supply constraints; monopolistic supply; poor transportation/utility infrastructure; weakness in connecting infrastructure; reliance on development of reserves.

Technology Risk

Technology risk during the operating phase centres on maintenance and performance within projected cost. This risk varies significantly by project type. Generally, when the technology is conventional and proven, the risk is not as great or it is easier to quantify based on past experience. Even technologies with proven reliability depend upon maintenance standards being met. Evidence of qualified staff, adequate budgets, availability of parts and consumables and, in some cases, manufacturer support is expected. Alternative sources for goods and services are seen as positive in mitigating cost and delays. Flexible opportunities for maintenance, an experienced operator and technology risk diversified over several units can all be positives. Technology risk increases significantly with new and unproven technology. A feasibility study should be undertaken by an independent recognised expert with a proven track record in the field. Issues addressed by the feasibility study should include: capacity, availability, expected outages, repair and maintenance levels, future required capital investments, spare part requirements, expected efficiency levels and environmental issues. The feasibility study is reviewed for completeness and consistency in its conclusions as well as its assumptions. Similar issues apply to connecting technology (see *Obsolescence/ Economic Life* section on page 16).

Stronger attributes	Many years of successful operating history and proven performance; low technical maintenance component; parts/labour widely available; diversified technology risk; minimal third-party supporting technology; warranty or service contracts; adequate redundancy inbuilt.
Midrange attributes	Limited sources of spare parts supply; limited number of experienced third parties; safety or environmental norms finalised.
Weaker attributes	Proprietary or innovative technology; untested over long term; revenues dependent upon high performance or availability; non-diversified operating assets; material dependence on external supporting technology; safety or environmental norms not finalised.

Tail Risk

Significant and unique financial risks may occur in the final years of a project arising from the project coming to the end of its life (such as reduced productivity or decommissioning), contractual obligations (such as handover) or renewal of licences, leases or concessions. Decreased revenue or increased capital expenditure may occur with an associated rise in default risk. Conversely, the imminent termination of a long-term agreement or concession may provoke the sponsor to economise on long-term capital expenditure where that flexibility exists. The impact on rated debt is often minimised by the existence of a “tail period”, ie the period between debt maturity and end of the project life or concession end date. Where this period is short or more importantly where termination payments or asset disposal is required for debt repayment, tail risk can be a dominant rating driver. Structural features such as grace periods, reserves and forward-looking cash sweep tests would be expected in such cases. Long tail periods would be expected in projects with un-quantified decommissioning costs. Refinance risks are considered as part of the financial analysis on page 20. It is important to note that Fitch considers the tail period in the context of its impact on cash flow available for timely debt service, not from the standpoint of recovery post default.

Stronger attributes	Project cash flows repay debt well before handover or expected termination; concession tenor or economic life significantly exceeds debt tenor; unconditional termination payment from highly rated party repays rated debt; strong structural features; no decommissioning /environmental liabilities.
Midrange attributes	Project cash flows amortise and repay debt before handover/termination; no material pre-handover capex; no reliance on asset disposal or condition; structural protections, eg cash sweep; known decommissioning or environmental liabilities.

Weaker attributes	Significant capex required to secure termination payment to repay debt; termination payment to repay debt exposed to market risk; weak structural protections; inadequate liquidity, tail or grace period; un-quantified decommissioning or environmental liabilities.
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Revenue Risk

Gross Revenue/Off-Take

Gross revenue of a project is typically driven by a combination of availability, price and volume. Risk arises if output or service cannot be adequately provided or demand for the output or service does not exist at a price at which the project is able to maintain volume or availability to meet its operating expenses and service its debt. The sources of gross revenue are typically either one or a few payers such as a concession grantor or major off-takers or multiple payers such as toll road users. Failure to meet contracted standards (timeliness, availability, quality or quantity) may incur penalties or deductions, reducing gross revenues. Predictability of cash flows is higher for availability- or capacity-based revenues and lower when revenues are a function of volume and/or price of the output. Fitch expects project contracts to clearly define the way payments are determined.

Typically, availability-based payment structures are in the context of a single or few payer projects. These are often less exposed to demand risk, thus bringing other risks to the fore such as performance against contract terms (availability, throughput and efficiency) or counterparty risks associated with the off-taker or concession grantor. However, there are exceptions such as shadow toll arrangements, which combine volume risk with a single concession payer. Generally, in higher rated projects, the purchase contract is a take-or-pay agreement or some other form of arrangement with limited conditionality, such as an availability payment under a concession agreement, for a term at least equal to the life of the rated debt, thus limiting volume risk.

Projects exposed to price and/or volume risk are often multi-payer projects. The volume and price projections established by the project's sponsors supporting the project economics are reviewed. As part of this analysis, Fitch prefers to receive a report or study conducted by an independent expert on behalf of the project company. This study, together with historical price and volume trends, market and macroeconomic forecasts and peer analysis, where available and appropriate, are used to assess the likelihood of price and volume combining to achieve the project's expected revenues. Fitch may also use its own forecasts and assumptions (eg oil and gas price forecasts). The use of historical information will depend on its quality and evidence of its predictive value. Historical information is likely to be more relevant for established projects where specific performance data is available. Fitch views assumptions or estimates based on such performance information as more reliable. Those volume and price risk factors identified as drivers of gross revenue are stressed as part of the financial analysis (see below). Like for like, Fitch would expect projects with price or volume risk to have the capacity to survive higher sensitivities than those without.

The mechanism of the contract by reference to price, volume or availability should result in a stable and predictable cash flow to the project so that it is able to meet its operating and maintenance expenses and service its debt. Mechanisms for determining output should be clear and objective, reducing potential for dispute.

Contracted or demand driven gross revenue may vary with the quality of the project's output, availability of the project facility, timeliness or quantity/efficiency of output. Failure of the operator to achieve these standards typically results in a reduced price or penalties deducted from a fixed concession payment (see *Operation Risk* section above). Where penalties may be incurred by the project vehicle due to sub-contractors, connecting infrastructure or suppliers, Fitch will look for the ability to pass through such penalties under the sub-contract. As with other compensation payments, including any from an off-taker, counterparty risk may be material.

Stronger attributes	Availability-based revenue with strong counterparty; limited deduction risk; limited delivery risk; fixed tariff “take-or-pay” contracts exceeding rated debt life; FX hedging; minimal reliance on demand or resource forecasts; matched costs and revenues; low-cost producer; demand at market prices; strong historical evidence of revenue patterns; lower volatility user-based revenues; diverse customer base; proven ability to pass on inflationary price increases.
Midrange attributes	Off-take agreements (with price risk); moderate deduction risk; market convention delivery risk; partial FX hedging; reliance on low volatility or proven resource forecasts; established long-term subsidy regime; competitive market position; moderate ability to pass on inflationary price increases.
Weaker attributes	Full exposure to market risks (price and volume); existing or expected competing facilities; significant deduction risk; special delivery risks; currency exposure; potential for increased royalties, windfall taxes or production limits; reliance on demand forecasts or resource forecasts of higher variability; politically sensitive subsidy regime; complex definition of output; limited ability to pass on inflationary price increases.

Obsolescence/Economic Life/Remediation

For project debt to be rated, its maturity should be within the expected economic life of the project. This expected economic life may only be achieved by significant capital expenditure, which typically would be covenanted within the project documentation. Obsolescence risk due to more efficient variants, competing innovation or demand shift is considered against the capacity of the project to invest in upgrades to maintain competitiveness and revenues. Contractual mitigants may exist via concession grantors, off-takers or suppliers. Obsolescence risk without mitigants may result in shorter economic life and lower revenues. Some sectors may have a higher risk of changing standards, requiring remediation expense during the operating phase, typically associated with safety or environmental issues. Fitch, as part of its analysis, will assess whether the tenor of the rated debt is consistent with the economic or concession life. The inherent uncertainty typically grows with technology: there is more likelihood that a telecommunications project will be obsolete and replaced with new technologies than is the case for a water distribution network, for instance. Decommissioning risk is considered under *Tail Risk* (see page 13). Importantly, publicly owned assets are more monopolistic and as a result will likely have longer or indefinite useful lives.

Stronger attributes	Debt maturity significantly within proven economic life; long lead times for competing capacity; established but current technology; capex budgeted for upgrades; no remediation risk; fully contracted use and handover.
Midrange attributes	10-15% economic tail after debt maturity; no evidence of emerging competing technology or potential demand shift; budgeted remediation costs.
Weaker attributes	Economic life co-terminus with debt maturity; identifiable environmental impact/un-quantified remediation risk; emerging competing technology, eg lower cost or substitute.

Termination Event Risk (Pre Maturity)

A risk of a termination event under any of the key contracts during the operating phase could have a material effect on ratings, particularly if compensation or lender structural protections (such as step-in rights and direct agreements) are not present. Examples of such events are termination of a concession, break clauses in off-take agreements or loss or failure to renew a licence, all of which may threaten project revenues. Acceleration of a financial agreement may have direct implications for the operation of the project or consequences indirectly via suppliers or other third parties. Appropriate grace periods in contracts, reserves or liquidity to give time for remedy without interruption of rated debt service

payments are key features. Of equal importance are contractual provisions for termination payments by the counterparty if they terminate the agreement or its terms are breached by the project company.

Stronger attributes	No contractual termination events; termination events compensated to repay rated debt on a timely basis; direct agreements (concession grantor/lender).
Midrange attributes	Low risk of termination with history of successful management of similar contracts; alternate supply arrangements; grace periods; lender step-in rights; compensation based on asset valuation.
Weaker attributes	Foreseeable termination events; compensation less than debt or unclear; renewal risks; tax clauses.

Macro Risks

Country and Political Risks

Country risk analysis for a project finance transaction starts with Fitch's sovereign rating and Country Ceiling for the project's host country, reflecting the default risk on sovereign obligations and the transfer and convertibility risk, respectively. If Fitch does not currently rate the country, the sovereign analysts perform an assessment of the credit quality of the sovereign. These ratings typically impose an upper limit on the credit quality of project debt but they do not capture all project country risk. External support or financial structuring may mitigate transfer and convertibility risk for individual debt instruments (see financial analysis starting with *Debt Structure* on page 17). Fitch does not rate for a change in law, regulation or tax. Nevertheless, the rating analysis will consider some of the qualitative factors and historical information about how material these risks can be in the relevant country.

In addition to the sovereign rating and Country Ceiling, Fitch reviews the political and regulatory environment in which the project is being constructed and operated. A stable and predictable environment for a project is evidenced by the government's commitment, public support and a consistent application of law and regulation. The likelihood of the government interfering with the project during the life of the rated debt is reviewed. Government interference with the project could result in reduced revenues, increased costs or impaired operation impacting debt service. Interference may take the form of unilateral contract variation, specific regulatory actions, exceptional taxes or royalties, forced changes in ownership or control or outright expropriation. Such behaviour will be considered more likely in a country with a history of such actions, although Fitch places emphasis on the incentives that exist for a government not to interfere negatively with the project. Where appropriate, Fitch will form a view on factors such as the political and economic importance of the project to the country, future reliance on external investment and government assurances regarding exchange controls, consents, approvals, stable environment and non-interference. Public support for the project is assessed as opposition to the project can result in delays or increased costs or, in more extreme cases, abandonment of the project. Factors such as national interest and projected impacts and benefits for local communities in terms of project output, employment or environmental damage may influence public support. Even where government and public support for a project appears strong, Fitch is cautious as this may not extend to support for debt investors in time of crisis.

Absence of a well-developed legal system that respects the validity of contracts and the rights of property owners and in which there exists well-settled corporate and commercial law may constrain the debt ratings. This is more likely in emerging markets where the ability to take comprehensive security over project assets and/or contracts or to enforce judgments from other jurisdictions may also be limited.

A country's general economic condition may not be directly reflected in its sovereign rating or in state/provincial ratings, particularly where there is low debt and strong cash flows from exploitation of natural resources, although there is usually a similar trend. Infrastructure may be weak, skilled labour in short supply, utilities unreliable and so on, all of which may impact the project and hence the debt ratings. Macro and microeconomic factors affecting the project's industry sector are discussed below.

Stronger attributes	'AAA/AA' country ceiling; creditor friendly and reliable legal system; history of impartiality and respect for contracts; long-term stable economy; supportive regulatory regime; project of national importance or essential for public good or services.
Midrange attributes	'A/BBB' country ceiling; clear legal framework, potentially untested ^a ; renegotiation risk in "national interest"; medium-term stable economy; predictable regulatory regime.
Weaker attributes	Speculative grade; jurisdiction potentially unreliable or not supportive of creditor rights ^a ; interventionist tendencies; political or economic instability; endemic delays for permits; public opposition; history of fines or disputes.
^a May include reference to Fitch emerging markets reports or external sources, eg World Bank	

Industry Risks

The agency considers the project in the context of its immediate industry sector in terms of relative competitive position, overall supply and demand and the general outlook for the industry. This includes not only similar projects but other industry participants such as corporates, state-owned enterprises and not-for-profit organisations. In this regard and for general industry outlooks, infrastructure and project finance analysts rely on Fitch corporate or public finance analysts from the relevant sectors. Barriers to entry or the essential nature of the sector are considered both at a global and local level, including industry-specific regulatory regimes or rules. Closely related industries encompassing suppliers, users or potential competitors are also examined. The general effect of macroeconomic factors, such as economic growth, commodity prices, inflation or exchange rates are considered.

Stronger attributes	Regulated industry with creditor-friendly regime; provides essential services; significant barriers to entry; positive industry outlook.
Midrange attributes	Established industry not fully supported by discretionary spending; some barriers to entry; stable industry outlook.
Weaker attributes	New industry; industry supported primarily by discretionary spending; few barriers to entry; negative industry outlook.

Debt Structure

In contrast to the foregoing project analysis, which considers the capacity of the project to generate cash flow and the stability of those cash flows, the following financial analysis considers each rated debt instrument separately, taking into account the quality of its individual debt characteristics, structural features, security rights and any external support. Fitch rates infrastructure and project finance debt instruments in accordance with their terms and conditions.

Debt Characteristics and Terms

The characteristics of a debt instrument, including its maturity, amount and currency, are usually sourced from the loan agreement or bond documentation; in some instances, a term sheet, prospectus or representations from issuers may be relied upon. The obligation to pay interest, including rate basis, margin, payment dates, grace periods and whether interest may be deferred and the obligation to pay principal according to an amortisation schedule, are established together with the priority of these payments.

Other terms of the instrument are reviewed keeping in mind the balance between protecting the investor and maintaining operational and financial flexibility. Fitch also considers the terms of the issuer’s other debt instruments for any impact on the rated instrument. Rights and control may only be of value when the rated instrument is in the controlling creditor class.

Stronger attributes	Senior-ranking debt - interest and principal; fully amortising debt; no de facto subordination; scheduled amortising principal commencing after completion; interest deferral on junior debt; no cross-default or acceleration; fixed interest rates.
Midrange attributes	Senior-ranking debt - interest and principal; within senior-ranking class but other debt within that class may mature earlier; amortisation may have limited interest-only period or some flexibility; some refinancing risk with mitigants; some floating-rate debt.
Weaker attributes	Non-senior debt; highly sculpted amortisation; bullet maturity; “loan-level” refinancing risk not mitigated; junior interest in priority to senior principal or reserves; cross-default and acceleration; floating-rate exposure.

Structural Features

A debt instrument may benefit from various structural features that can underpin the cash flows supporting debt service. These may include covenants and triggers to trap or divert cash based on financial ratios, which may be to the benefit or detriment of the instrument, usually depending upon its priority. General covenants are expected to restrict additional debt, restrict payments to sponsors or equity holders and typically retain cash for future periods, when financial indicators are deteriorating, to benefit creditors. Cash diverted or retained is typically allocated to reserves or principal reduction of the most senior debt. Contractual arrangements often exist between creditors to determine the priority of payments for costs, fees, swap payments, interest and principal (payment “waterfall”). Fitch analysts will review payment waterfalls to see if they are consistent with other assumptions, are reflected in the model (see page 20) and under what circumstances they may change. Access to debt service reserves, events of default or covenants transferring control are assessed.

Stronger attributes	Forward-looking covenants and triggers; early dividend lock-up and cash sweep; access to debt service reserves; sinking funds or capex reserves; immediate reserve replenishment consistent with rated instrument priority.
Midrange attributes	Dividend lock-up and cash sweep triggers; access to debt service reserves; reserve replenishment.
Weaker attributes	Weak dividend lock-up; no cash sweep; junior or no access to reserves; no reserve replenishment.

External Financial Support

Swaps, liquidity lines, letters of credit and guarantees may benefit some but not all instruments by limiting or transferring risk but increasing associated counterparty risk (see *Financial Counterparty Risks* on page 23). Swaps are most commonly used to hedge interest costs but are also used to mitigate foreign exchange, inflation or other risks. Where the notional amount to be hedged is variable or a direct hedge is not available, mis-matching of basis, maturity or notional may leave open or over-hedged positions. Liquidity lines typically provide independent issuer-level protection direct to rated debt against interruptions in operational cash flows. SPP level working capital and reserve facilities should be independent of short-term project performance with minimal conditionality. Guarantees often act to substitute the better creditworthiness of a financial institution, parent or group for that of a sponsor or transaction party - for effective (typically timely, unconditional and irrevocable) guarantees, the obligations of the transaction party would be assessed based on the credit of the guarantor. Similarly, timely, unconditional and

irrevocable guarantees provided by financial institutions and governments would be given credit. Instruments benefiting from bond insurance (or an equivalent unconditional, irrevocable commitment to full and timely payment of the rated instrument) will be assigned the higher of the underlying Fitch infrastructure and project finance rating or the Fitch rating for the “insuring” counterparty.

Stronger attributes	Revenues hedged to debt service; access to “issuer” liquidity; debt instrument guaranteed/indemnified.
Midrange attributes	Partial hedging; benefit from project guarantees (eg from parent or sponsor); support timely, unconditional and irrevocable.
Weaker attributes	Unhedged financial risks; weak hedge counterparties; conditional support; support expires before debt maturity.

Security Package and Creditor Rights

The benefits of security or creditor rights to the rated bondholders can be manifested in reducing either the likelihood of default or the loss severity given a default. However, it is only the former benefit that is considered when assigning an infrastructure and project finance rating. Where a jurisdiction permits, the granting of available security (over key economic, financial and intellectual assets) in favour of debt-holders is viewed as conventional. Post enforcement, security interests in key project assets and contracts would be expected to attach in the same rank order as debt-holder priority and ideally confer controlling rights prior to enforcement. Pre-enforcement controlling rights potentially reduce the likelihood of default and are typically the more significant rating aspect of the security package. Step-in and other rights providing senior investors with the ability to protect key contracts and assets or to initiate replacement of failing transaction parties would be expected together with security interests granted by project owners over their ownership interests in the SPP. Comprehensive inter-creditor agreements limiting the scope for individual pre-emptive action and defining the pre-enforcement controlling class of creditor may reduce uncertainty regarding project assets in adverse circumstances. Much of this also relies on a reliable and creditor-friendly jurisdiction. Control of material insurance proceeds, either to ensure project reinstatement or debt repayment, is also desirable.

Stronger attributes	Senior-ranking security interests over all operating and intellectual assets, contract rights and cash balances; first payee of material insurance proceeds; contract step-in rights; creditor-friendly jurisdiction; first security interest in shares of project company; controlling class; early transfer of cash control from operator to trustee.
Midrange attributes	Senior-ranking or controlling security interests over key operating and intellectual assets, contract rights and cash balances; “equitable” interests in some assets; senior position if collateral held via security trustee; control of material insurance proceeds; minor super-senior statutory creditors; controlling class absent protection test.
Weaker attributes	Non-senior-ranking security interests or subordinate position via security trustee; significant or unquantifiable statutory super-senior creditors; untested or cross-jurisdiction collateral structure; no post-enforcement control; transfer of cash control post default.

Refinance and Recapitalisation

Projects exposed to either refinance risk (debt not fully amortised at maturity) or recapitalisation risk (additional finance required before existing debt maturity to maintain project viability) are typically viewed as structurally weaker from a credit perspective as they present more uncertainty. However, for debt instruments benefiting from substantial amortisation, significant residual project value or structural mechanisms that ensure an alternative repayment mechanism to facilitate refinance, rating impact may be limited. All other factors being equal, such circumstances would typically not achieve the ratings of a fully amortised

equivalent instrument. Projects requiring recapitalisation to build out or maintain cash generating assets supporting existing debt would usually be rated on the basis that the recapitalisation did not occur, hence limiting the rating or the amount of rated debt, unless funds are committed by a strong counterparty.

Stronger attributes	Limited refinancing risk in comparison with residual value of the asset; cash sweep features ahead of refinancing to reduce exposure; incentives for early refinancing; flexible hedging structures; no recapitalisation needs; very high multiple of asset value to outstanding debt; equity lock-up three years prior to final maturity; existence of regulated asset base; ability to extend expected maturity of the debt if refinancing is not possible.
Midrange attributes	Multiple of asset value to outstanding debt; recapitalisation but not essential for debt service; progressively increasing equity lock-up/ cash sweep; penalty margin interest rate step-ups; slowly amortising debt.
Weaker attributes	Recapitalisation risk to ensure economic life co-terminus with debt maturity; low to moderate asset-value multiple to outstanding debt; limited equity lock-ups prior to maturity; weak cash sweep.

Debt Service and Counterparty Risk

Having reviewed the debt structure of each rated instrument, these features are combined with a more quantitative approach to determine the capacity of each instrument to maintain debt service through a range of stresses. The creditworthiness of both project and financial counterparties, in the context of their obligations, is also incorporated into the rating. Peer analysis may be used wherever appropriate.

Models

Models used in project finance are generally cash flow models projecting operational cash flows and debt service based on assumptions input as variables. These models are not stochastic, and only allow single or combined factor sensitivities to assess the impact on debt service. It is important to reiterate that model outputs are only one factor in a Fitch analysis. A project for which credible projections show strong ability to repay rated debt may still be assigned a speculative-grade rating, or even no rating at all, if some more qualitative risks (for instance, country risk, sponsor insolvency or industry risk) are deemed very material.

Due to the idiosyncratic and complex nature of most projects, Fitch does not have its own standard model. The agency judges that adapting a standard model to reliably incorporate the many individual features of a project is not justified when compared to focussing on analytic drivers such as choice of stress (below) and using an arranger's project-specific model to evaluate these. When using results from an external model, Fitch prefers that it has been independently checked, ideally by a reputable third party. The agency's analysts also consider the plausibility of results from external models by examining trends and sensitivities, making estimates and adjusting individual parameters. Despite these precautions, as with all types of information provided by issuers, Fitch is reliant on the issuer ensuring that the information is timely, accurate and complete.

Base Case

For most projects, Fitch will establish a cash flow base case, which serves as the agency's expected case for rating surveillance and as the common starting point for stress analysis. The base case is often established by adjusting the issuer's central forecast to make it consistent with Fitch criteria and forecasts. Additionally, the agency's analytical assumptions specific to the project will be incorporated.

Project Stresses

Having established a base case, Fitch applies a series of stresses to parameters identified as key in the project analysis. Parameters such as delays, input and output prices, demand or utilisation levels, performance, lifecycle and other costs may be stressed, either in value or in timing. Additionally, the cash flow impact of structural or legal changes may be estimated and remodelled. The purpose is to test the sensitivity of cash flows available to each rated debt instrument to changes in these parameters. Certain key project variables may be hedged, either contractually or through natural positions. Fitch considers the effectiveness of such arrangements and any remaining risk from imperfect hedges (basis risk) or residual unhedged positions may be the subject of stress tests.

Financial Stresses

Financial stresses are considered in a similar manner to project stresses; some may only apply to individual rated debt instruments. Common financial stresses such as inflation, interest rates and foreign exchange rates may be hedged or partially hedged. In such cases, the result of a stress may be a material increase in counterparty risk against the protection seller. Financial stresses may include the potential default and replacement of any counterparty with a material financial obligation to the SPP or issuer SPV. The quantum of financial stress applied is typically by reference to forecasts from an appropriate analytical group within Fitch. The stress will be applied in the direction adversely affecting cash flows for the rated instrument.

Combined Downside, Breakeven and Rating Cases

A combination of project and financial stresses or a series of individual stresses of a severity consistent with a particular rating level (sometimes referred to as a “rating case”) are identified, typically by reference to historical events, peer analysis (see below), forecasts and Fitch’s expectations for the future. These may reflect a particular “scenario” of events. They are used either by selecting base-case metrics providing relevant cover or by modelling the stresses to test that the rated instrument does not default. The method employed for a particular sector is usually determined by the type of information available and the importance of peer analysis, which often relies upon metrics. When selecting stresses, the sensitivity of cash flows to changes in the stress is considered to achieve a degree of rating stability. The choice of the rating case is a key quantitative determinant of the rating and is typically a central point of discussion in rating committees.

Metrics

The results of these stresses are typically summarised by using various “metrics”, often in the form of ratios, often used in combination. Metrics are used selectively as appropriate to the sector (asset class) or transaction structure. Metrics associated with a given rating category can vary widely depending on the nature of the project and the potential volatility of cash flows. When possible, Fitch will provide medians and ranges in sector-specific criteria. It is important to note that such metrics are an input in determining a rating to the extent that they summarise in a single number Fitch’s views on certain risks and, in particular, their impact on a project’s cash flows. Some “binary” risks cannot be reflected in cash-flow projections (for instance, termination risk) but are also key drivers of the eventual rating.

Common among metrics are the following:

Loan Life Cover Ratio (LLCR)

This is the net present value (NPV) of the cash flow available for debt service after operations and covenanted mandatory capex (CFADS), from the calculation date to the maturity of the rated debt instrument (including initial debt service reserve account (DSRA) and other available cash), divided by the principal outstanding on

the rated debt instrument (plus all equal-ranking and senior debt) at the calculation date. Cash flows are discounted at the weighted-average cost of debt to maturity. Residual values at maturity are excluded unless assets are specifically structured to be liquidated. This metric is indicative of total capacity for debt service over the life of the rated instrument.

Project Life Coverage Ratio (PLCR)

This is the NPV of CFADS over the remaining project life, divided by the principal outstanding on the rated debt instrument (plus all equal-ranking and senior debt) at the calculation date. In this case, the remaining project life can be the remaining life of the concession term or power purchase agreement, etc. In cases where the remaining life of the concession is very long, Fitch substitutes an economic project life depending on the nature of the asset, since it becomes impractical to evaluate project cash flows for a longer period.

The PLCR is a useful alternate metric to the LLCR in situations where long-term debt is not available, and where cash-flow coverage is too narrow to retire debt over the shorter available debt life. The PLCR looks at the economic capacity to retire debt over the economic life of the project. The discount rate used to calculate the NPV of CFADS can incorporate varying assumptions about the cost of capital.

Minimum Annual Debt Service Cover Ratio (Min. ADSCR)

This is the lowest ADSCR for the rated debt from the calculation date to maturity, where the ADSCR is calculated as: CFADS in the given year, divided by the total amount of equal-ranking and senior debt service due (principal and interest) in that year. The numerator excludes cash balances standing to the credit of the borrower's accounts and/or the DSRA and reflects the deduction of covenanted maintenance capex. The Min. ADSCR may be compared to the average ADSCR (or other ADSCR statistic) to assess overall stability of debt service. A similar analysis may be done under stress conditions as well as including reserves and liquidity to the numerator, which reveals the strength of these protections when a stress is simulated. This metric is indicative of the most stressful period for amortising instruments. For instruments with bullet maturities, an equivalent interest coverage metric may be used. Min. DSCR may also be calculated on a quarterly or semi-annual basis.

Gearing Ratio

This is total debt (excluding self-liquidating working capital) divided by total capitalisation (debt plus shareholder funds) expressed as a percentage. This may also be referred to as the capitalisation ratio.

Project Counterparty Risks

Performance risk is addressed as part of the project analysis, whereas this section addresses financial obligations of project counterparties such as off-takers, concession grantors, equipment warranty providers and insurers. Compared with financial counterparties, there is typically a greater potential for dispute and hence delay in payment. The consequences of delay for debt service may be more significant than the amount in dispute. As with risk for financial counterparties, Fitch's rating of the counterparty is the starting point. However, there are typically more cases where a Fitch rating is not available or the analyst relies on an internal shadow rating or credit opinion. Absent a specific dependency or linkage, third-party data may be used, particularly where Fitch has insufficient information to form a rating opinion. The capacity of the counterparty is related to the type and likelihood of occurrence of the risk. In many cases, both an operational and a financial failure have to occur before there is a loss of cash flow.

Stronger attributes	All material counterparties rated at or above the senior project debt rating and capable of replacement; no material obligations that would cause a rating dependency; legally binding obligation; no history of disputes.
Midrange attributes	Material counterparties of proportionate credit quality; material counterparties capable of replacement without impacting rating; obligation subject to conventional conditions for sector (eg set-off); precedent for financial enforcement in jurisdiction.
Weaker attributes	Potential for rating dependency; material counterparty not capable of replacement; less material counterparties of lower credit quality than the project senior debt; history of contract disputes or payment delays; enforcement via legal process not effective (eg not timely, not impartial).

Financial Counterparty Risks

Fitch considers the creditworthiness of counterparties to swaps, liquidity facilities, performance bonds, letters of credit, guarantees, working capital and reserve facilities and similar financial parts of a transaction. Primarily this is based upon a Fitch rating assigned by the relevant analytical group. Where a Fitch public rating is not available, an internal private or shadow rating will be sought in the case of counterparty risk material to the project finance rating. Rating dependencies (where a change in counterparty rating may impact the project finance rating) will be highlighted and any rating linkage (where the project finance rating will move with the counterparty rating) will be made explicit. Structural features to mitigate deteriorating counterparty risk, such as rating triggers or financial ratio tests, are examined. The quantum of monetary exposure to a financial counterparty may be assessed by reference to a replacement cost where there is a good basis for this (transparent pricing, suitable replacement counterparties, active market, minimum delay, standard contracts, etc). This may also be possible for project counterparties, but typically with more uncertainty. Financial counterparties with extensive project or infrastructure experience or strong relationships with sponsors may be viewed favourably for more complex transactions.

Stronger attributes	All counterparties rated one category above the senior project debt; rating triggers for replacement or collateralisation; rating consistent with Fitch's counterparty criteria; regular valuation calculation for market-based exposure; liquid instrument.
Midrange attributes	Rating consistent with Fitch's counterparty criteria but weaker rating triggers; suitable replacement counterparties available.
Weaker attributes	Rating inconsistent with Fitch criteria; weak or no rating triggers; potential for rating dependencies; limited market for instrument with few suitable replacement counterparties; difficult to value instrument.

Peer Analysis

Where information on appropriate peer projects is available to Fitch (usually for the same sector, region and structure), this will be used for comparative analysis of individual risk factors (both qualitative and quantitative) or in establishing the rating, with respect to the peer group. Projects in different sectors or with different structures may present quite different qualitative features and credit metrics at a similar rating level due to factors such as legal framework, stability of cash flows or structural features, making such comparisons of less value. Peer analysis is likely to play a more important role in sectors where the portfolio of ratings is more developed. Fitch may use normalising assumptions (such as a common annuity-based amortisation schedule) to better compare rated debt from peer projects.

Surveillance

Existing ratings are monitored and reviewed in accordance with Fitch's established criteria and methodologies for the type of rating. The likely adequacy and frequency of ongoing information will be considered at the time of the initial rating

to provide a good prospect that the appropriate standard of surveillance can be maintained. Periodic information relating to a project such as financial statements/management accounts, performance data, technical reports, construction progress reports, budgets and forecasts are expected to be received by Fitch at least once a year until maturity of all rated debt. Once received, this information is screened by an analyst for materiality and consistency with the expected case. Material new information or exceptions are referred to a senior analyst and a decision taken whether to initiate a full review of the rating. Significant market events, changes in counterparty ratings or changes in law or regulation may also trigger a full review. Full reviews are undertaken periodically in any event as required by Fitch policy. Information received as part of the surveillance process may lead to requests for further information and revisions in Fitch's base and stress cases (either quantum or factors).

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