What Investors Want to Know: Energy-from-Waste and Biomass Projects

Growing Interest in EfW Projects: Fitch Ratings expects a continued worldwide expansion in the number of energy-from- waste (EfW) facilities in a drive to divert waste from landfill. The recent restriction on imports of certain wastes by China and plastic waste in particular, may further stimulate the growth of EfW.

Diverse Ratings of EfW/Biomass Projects: The relatively small portfolio of ratings assigned by Fitch in this sector is diverse, with the highest rating at 'BBB' and lowest at 'CCC'. Many projects have been rated in the 'BB' and 'B' rating categories.

Over the 2018 summer Fitch met with several investors and financial advisors to discuss EfW and/or biomass projects and address questions on Fitch's rating approach to such projects, the key rating drivers, and possible rating constraints. In this report we address the following frequently asked questions raised in these meetings.

- Which rating methodology is used to rate EfW and biomass projects?
- Are portfolios of EfW projects rated under the Corporate Rating Methodology?
- How does Fitch assess operation risk?
- Could the operator's rating constrain the project rating?
- What role does supply risk play in Fitch's assessment?
- How important are the independent expert reports for rating EfW projects?
- What is Fitch's approach to assessing revenue risk?
- What role does counterparty risk play?
- How does contract renewal risk flow in the analysis?
- How does Fitch construct the relevant financial thresholds for EfW projects?
- How does Fitch construct its rating case scenario?
- What gate fee and power price forecasts does Fitch use for merchant revenues?
- How does Fitch approach completion risk of EfW projects?
- Does Fitch approach EfW projects subject to PPP/PFI frameworks differently?
- Can EfW credits achieve investment-grade ratings?
- What are the examples of Fitch's ratings?

Which rating methodology is used to rate EfW and Biomass projects?

EfW projects are assessed under Fitch's *Thermal Power Project Rating Criteria*, since they involve a thermal process. These criteria are sector-specific and are used together with Fitch's *Rating Criteria for Infrastructure and Project Finance* (Master Criteria). The criteria consider the same key risk factors as for other sectors within the infrastructure and project-finance sector, but three in particular tend to play a distinguishing role for EfW compared to "more standard" thermal power plants such as coal- or gas-fired generators: operation risk, revenue risk, and supply risk. These are assessed as Stronger, Midrange of Weaker and are discussed in turn in further detail below.

The same approach and criteria are used for biomass projects since they also involve a thermal process, rather than Fitch's *Renewable Energy Project Rating Criteria* even though under some circumstances biomass feedstock can be considered renewable.

Are portfolios of EfW projects rated under the Corporate Rating Criteria?

Single-site assets will be rated under the *Rating Criteria for Infrastructure and Project Finance* and *Thermal Power Project Rating Criteria*. Portfolios of several or more assets may be rated under either these criteria or the *Corporate Rating Criteria*. The most appropriate rating criteria will be determined on a case-by-case basis. A static portfolio of a few assets in one jurisdiction with no material additions or disposals anticipated would be more commensurate with a project finance approach, while an entity that is planning substantial additions and future growth may be more commensurate with a corporate rating approach.

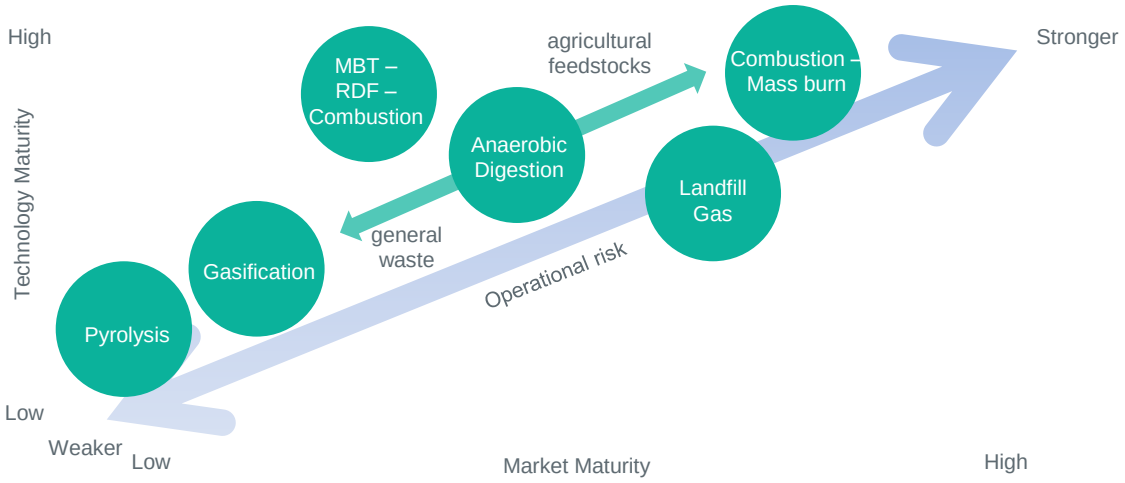
How does Fitch assess operation risk?

Operation risk in the EfW sector is largely driven by technology risk. Thermal power projects in general tend to use proven and widely implemented technology, but for EfWs less proven technology is encountered more frequently.

Fitch's view broadly follows the figure below. Please note that the figure shows trends, the exact positioning of technologies on this risk spectrum is subject to specific details applicable to each project. Technologies that are not considered commercially proven will generally constrain the ratings to below investment grade. Generally speaking, this applies to technologies that do not have a commercial track record of four to five years, unless the risk of technology performance is adequately mitigated (for example, by equipment manufacturers of financial standing providing technology performance guarantees).

In this manner, Fitch considers that gasification and pyrolysis technologies are not commercially proven as of today. It may be a coincidence, but the extremes of the distribution of Fitch's EfW and EfW-like ratings happen to align with the assessment of technology risk shown in the figure below, with a pyrolysis project rated at 'CCC' and mass-burn project at 'BBB'.

Technology Risk



MBT: mechanical biological treatment; RDF: refuse-derived fuel.
Source: Fitch

Could the operator's rating constrain the project debt's rating?

Fitch would not expect the operator's rating to constrain the project debt's rating unless the technology is proprietary and there is no meaningful selection of alternative operators. However, the experience, track record and financial strength of the operator will also flow into the assessment of the operation risk and will determine stresses that Fitch applies to the operating costs in our financial analysis.

What role does supply risk play in Fitch's assessment?

Supply risk is typically higher for EfW projects than for conventional thermal power plants. This is because feedstock sourcing arrangements tend to be more complex and typically depend on very local or regional circumstances. For example, an anaerobic digester fuelled with biowastes is likely to depend on supplies from local farmers, or an MBT plant may depend on a stream of food wastes. In contrast, coal- or gas-fired power stations typically use relatively standardised bulk commodities available and traded on the world market. The most commonly available type of waste used in EfW plants is municipal solid waste.

Key factors in determining available suitable feedstock are typically total raw waste produced in a given catchment area (also termed waste arisings) and subsequent recycling rates, since EfW is usually seen as a solution for treatment of residual, non-recyclable waste. The ability to supply the plant throughout the life of the debt will depend on the availability of suitable waste and the ability of the plant to compete on gate fees with alternative disposal routes. Typical alternative routes or competing solutions are:

- landfills;
- exports of waste, which may be subject to regulatory changes, for example RDF;
- other EfW plants; and
- alternative uses of waste such as industrial.

Another difference between EfW and a standard thermal power plant is that feedstock supply may also be a source of revenue rather than a cost ("reverse offtaker"). This leads to an intertwining of Fitch's supply and revenue risk assessments due to links between availability of suitable feedstock and achievable waste revenues (tipping fees or gate fees). In the case of such intertwining, supply risk analysis will focus more on the physical availability and quality of feedstock, while revenue risk analysis will focus on the commercial arrangements with respect to revenues received from gate fees.

Finally, the consistency of waste input composition is also often an issue in EfW projects. The sensitivity of the technology to waste input composition will be a factor not just in relation to operation risk but also to supply risk, as it will affect the availability of suitable feedstock. The more sensitive the technology is to waste input composition, the more it will narrow what waste can be processed to a diminishing subsection of total available waste. Additionally, composition will affect the calorific value (CV) and typically determine the amount of waste that can or needs to be processed by a plant given a fixed design thermal capacity. For example, this could be caused by additional recycling of plastics which tend to have a higher CV than the average of municipal waste, thereby lowering the average CV of the remaining waste and increasing the tonnage required to be processed to generate the same amount of energy.

How important are the independent expert reports for rating EfW projects?

Fitch considers technical due diligence reports and feedstock reports/studies from independent parties important when rating EfW projects. The quality of the feedstock report is key, and is expected to give a view on waste potentially available to the plant, and at what gate fees. The quality and depth of the feedstock study will influence the adjustments such as haircuts which are applied as part of Fitch's analysis to waste supply or price/gate fee assumptions. Technical due diligence reports are particularly important for projects using less proven technology and Fitch expects technical advisors to demonstrate substantial familiarity and experience with the technology used and its application.

What is Fitch's approach to assessing revenue risk?

The assessment of revenue risk concerns the fundamental basis of project cash flows and, therefore, factors heavily into EfW ratings. When assessing revenue risk, the focus is on the degree of exposure to market-driven (merchant) prices as well as counterparty credit quality. We also consider the duration and flexibility of the revenue streams, the predictability and stability of dispatch levels, and the stability of the regulatory support framework (in case a project receives any regulated income streams). The share of merchant revenues will also directly affect the calculation of the financial ratio threshold for a given rating category, as set out in further detail below. Due to their particular circumstances such as exposure to weaker counterparties and/or merchant prices, EfWs are less likely to have their revenue risk assessed as Stronger and are typically assessed as Midrange or Weaker.

Generally, EfW facilities tend to derive income from a range of sources, the main ones being revenues from gate fees and electricity sales. Where the feedstock is a cost rather than a gate fee, most of the revenues come from the sale of electricity. There may also be some income from the sale of steam and recyclates, such as metals, glass, paper, and plastics from pre-treatment processes or metals recovered from bottom ash during post-treatment.

Contractual Structures for Key Revenue Streams

Gate Fees	Electricity	Steam
Simple volume based	Fixed ↔ variable price PPAs	Fixed ↔ Variable Price PPAs
Put or pay[a]	Floor price PPAs	Floor price PPAs
Exclusivity[a]	Contracts for difference	Government subsidies
	Capacity payments through PPA or other capacity support mechanisms	

[a] With or without explicit make-whole for loss of energy
Source: Fitch PPA: Power Purchase Agreement

What role does counterparty risk play?

The credit quality of revenue counterparties as well as feedstock supply counterparties is an important consideration in our analysis. Generally, a Fitch rating is required for counterparties whose financial performance is key to the performance of the project. For EfW projects these are typically the counterparties that contribute a significant share of revenues and committed to specific contractual terms. Where no rating published by Fitch is available, an internal private rating can be used. This would also typically apply where the counterparty is a government-related entity (for example, a UK local authority).

Fitch has observed that EfW projects may have several counterparties in the contractual structure, including several feedstock suppliers in addition to an "anchor" waste supplier and an offtaker of electricity output and/or steam output. Where there are several counterparties present, the credit quality of the weakest counterparty will typically serve as a cap on the project's debt rating, unless it can be proven that the project does not necessarily default if that counterparty falls away. This may be the case for counterparties with a less significant contribution to the project's revenues or when there are alternative counterparties that the project could contract with, as confirmed through market analysis. In this case, Fitch will assume merchant prices for that portion of revenues.

Revenue streams from the sale of other products (recyclates, bottom ash) represent a small share of revenues and the credit quality of these counterparties is typically not a key area of examination, although we may apply stresses to this portion of revenues in our financial analysis.

More generally, there may be situations when Fitch's assessment of the credit quality of the payment obligation is not constrained by the payment counterparty's credit quality, because the payment risk ultimately lies with a broader sector or a group of end-users. As an example, this is the case for the contracts for difference regime supporting power generation in the UK.

How does contract renewal risk flow in the ratings analysis?

Where a contract expires during the life of the debt, Fitch will assume that such a contract is not renewed and will assess it as merchant from that point onwards, given that there is no certainty that it will be extended.

How does Fitch construct the relevant financial thresholds for EfW projects?

Fitch carefully considers the nature of the various revenue streams and classifies them as either "merchant" or "contracted"' (ie "non-merchant"'). This classification depends on how a particular revenue contract is structured with respect to the degree of price exposure as well as the counterparty's rating, leading to a calculation of the blended coverage ratio threshold for a certain rating level. This blended coverage ratio is determined by calculating an average between the merchant and non-merchant guidance from the *Thermal Power Project Rating Criteria*, weighted by the relative volumes of respective revenues under a Fitch rating-case scenario.

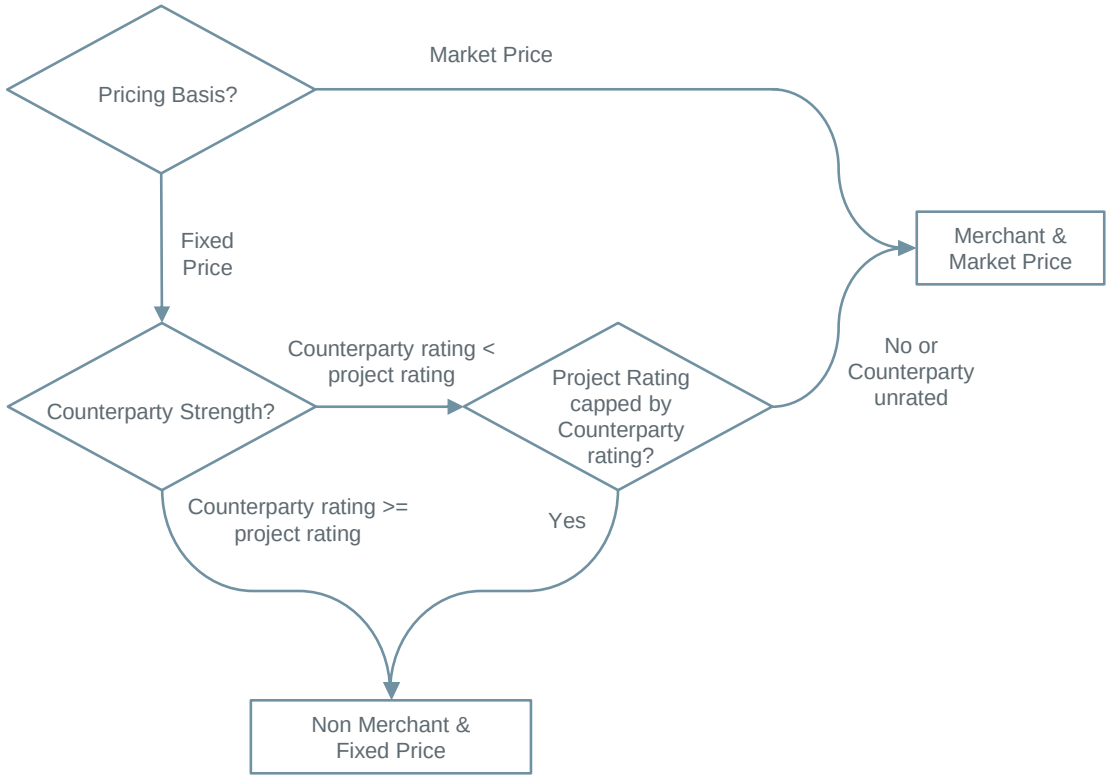
Indicative Coverage Ratios Guidance — Fully Amortising Debt

Fitch Rating Case (x)	Revenue Risk KRD	'A–' DSCR Profile	'BBB–' DSCR Profile	'BB–' DSCR Profile[a]	'B–' DSCR Profile
No merchant exposure					
	Stronger	1.5	1.3	1.15	1
	Midrange/Weaker	1.6	1.4	1.2	1
Full merchant exposure	Weaker	n.a.	1.8 and higher	1.4	1

[a] Coverage thresholds for ratings at or below the 'B' category are guided by Fitch's ratings definitions for those categories, and also the assessments assigned for all the qualitative key rating drivers. For partially merchant projects coverage thresholds are calculated using coverage guidance for projects in the Full Merchant Exposure Weaker and No Merchant Exposure Midrange/Weaker revenue key rating driver (KRD) categories. n.a. – not applicable.
Source: *Thermal Power Project Rating Criteria,* 1 June 2018

The following diagram sets out the decision tree that determines whether a revenue stream is treated as merchant or non-merchant, and what price assumptions are used in Fitch's financial projections as well as for the revenue cash flows used in the construction of the blended coverage ratio threshold.

Illustrative Flow Chart for Revenue Treatment in Blended Ratio Threshold



Source: Fitch

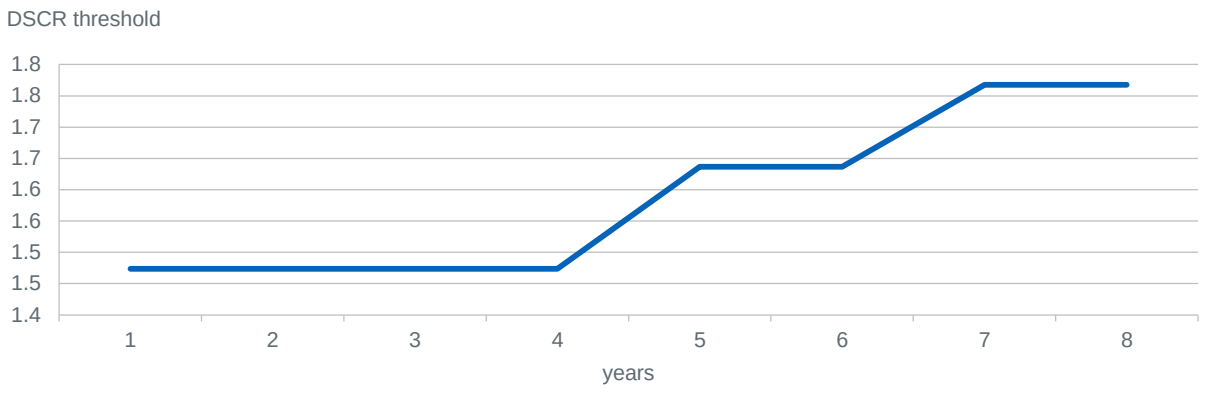
Where the relevant revenue stream is subject to market pricing, this will lead it to be assessed as merchant, even if there is a market-based PPA. The counterparty's rating in this case is not a rating constraint.

The following examples illustrate this approach for a hypothetical project that aspires to an investment-grade rating, but where revenue risk is assessed as Midrange/Weaker due to a partial exposure to market-based/merchant pricing.

In the first example, a project is due to receive gate fees from two investment-grade rated entities and a selection of unrated counterparties. Following the flow diagram, the projected income from investment-grade rated entities will be treated as non-merchant revenues, whilst the income from the unrated counterparties is treated as subject to merchant exposure. The project is also assumed to be receiving electricity income through a PPA with a floor from an investment-grade rated counterparty. The income arising under the floor is deemed to be without merchant exposure, whereas the forecast income above the floor is, since it is subject to market prices. The contracted and merchant revenues (as projected in Fitch's rating case scenario) are each totalled and the relative weight of each used to calculate the proportion of non-merchant and merchant revenue, resulting in the calculation of the 'BBB-' indicative DSCR threshold for each year of the debt life. The waste supply contract with counterparty A expires in year 5 and no contract renewal is assumed, therefore this portion of revenues is assumed to be merchant from thereon.

Example 1												
Year	**FP or MP**	**M/NM**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Gate Fees (GBP 000)												
Exclusivity with 'BBB-' counterparty A	FP	NM	A	105	110	116	122	-	-	-	-	
Put-or-pay element with 'BBB+' counterparty B	FP	NM	B	32	33	35	36	38	40	-	-	
Forecast waste element from 'BBB+' counterparty B	FP	NM	C	53	55	58	61	64	67	-	-	
Merchant waste - various unrated counterparties	FP	M	D	42	44	46	49	179	188	310	325	
Electricity (GBP 000)												
Floor with 'A-' counterparty C	FP	NM	E	21	22	23	24	26	27	28	30	
Forecast income above floor	MP	M	F	5	6	6	6	6	7	7	7	
Total			G=A+…+F	257	270	284	298	313	328	345	362	
% Non-Merchant			H=(A+B+C+E)/G	82%	82%	82%	82%	41%	41%	8%	8%	
% Merchant			I=(D+F)/G	18%	18%	18%	18%	59%	59%	92%	92%	
'BBB-' threshold for...												
No merchant exposure (Midrange/Weaker)			J	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
Full merchant exposure			K	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
Blended			H*J+I*K	1.47	1.47	1.47	1.47	1.64	1.64	1.77	1.77	
Source: Fitch	FP = Fixed Price, MP = Market Price, M = Merchant, NM = Non Merchant											

Example 1

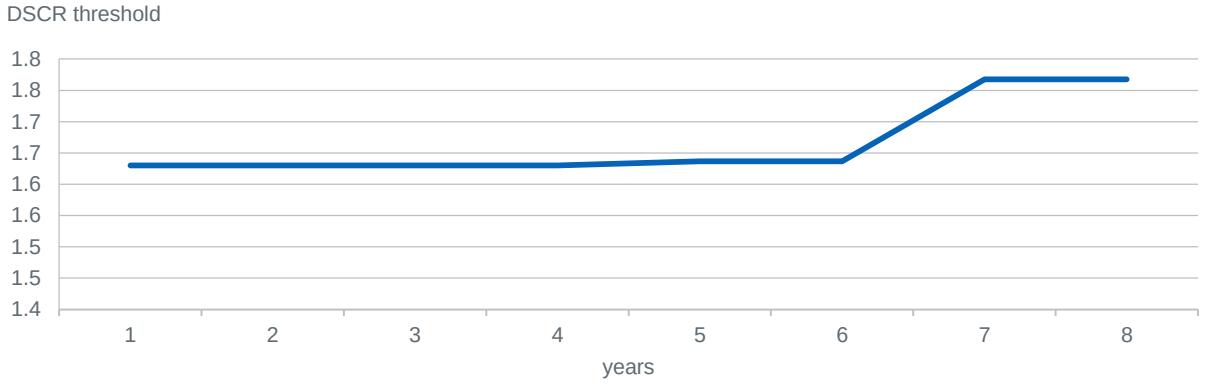


Source: Fitch

In the second example, the difference is that the first waste supply contract is with an unrated counterparty A and even though it is a contract with fixed prices, no credit is given to this with the corresponding revenue stream treated as merchant. Accordingly in this scenario, the blended threshold for 'BBB-' rating in accordance with the *Thermal Power Project Rating Criteria* is higher until Year 5 when compared to the first example.

Example 2											
Year	**FP or MP**	**M/NM**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Gate Fees											
Exclusivity with unrated counterparty A	FP	M	A	95	99	104	109	-	-	-	-
Put-or-pay element with 'BBB+' counterparty B	FP	NM	B	32	33	35	36	38	40	-	-
forecast waste element from 'BBB+' counterparty B	FP	NM	C	53	55	58	61	64	67	-	-
Merchant waste - various unrated counterparties	FP	M	D	42	44	46	49	179	188	310	325
Electricity											
Floor with 'A-' counterparty C	FP	NM	E	21	22	23	24	26	27	28	30
Forecast income above floor	MP	M	F	5	6	6	6	6	7	7	7
Total			G=A+…+F	247	259	272	286	313	328	345	362
% Non-Merchant			H=(B+C+E)/G	43%	43%	43%	43%	41%	41%	8%	8%
% Merchant			I=(A+D+F)/G	57%	57%	57%	57%	59%	59%	92%	92%
'BBB-' threshold for...											
No merchant exposure (Midrange/Weaker)			J	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Full merchant exposure			K	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Blended			H*J+I*K	1.63	1.63	1.63	1.63	1.64	1.64	1.77	1.77
Source: Fitch	FP = Fixed Price, MP = Market Price, M = Merchant, NM = Non Merchant										

Example 2



Source: Fitch

How does Fitch construct its rating case scenario?

The rating case is designed to represent an adjustment to the base case through the application of a combination of stresses. The stresses are chosen to simulate a scenario of considerable underperformance, which whilst in most circumstances is conceivable occasionally, is not necessarily expected to persist during the life of an EfW or biomass project financing. For EfWs, this will typically consist of adjustments to waste volumes, waste pricing forecasts, electricity pricing forecasts, plant availability, waste CV, electrical efficiency, operating and maintenance costs. Further details can be found in the *Thermal Power Project Rating Criteria*.

What gate fee and power price forecasts does Fitch use for merchant revenues?

Fitch will review the feedstock study if provided for projections in relation to gate fees for the specific project, with due considerations given to the key drivers of residual waste in the longer term in a specific geographic location. For power price forecasts, Fitch will rely on studies from a specialist power market advisor, if provided. Fitch has found that independent experts typically provide a "central" case and a "downside" case. Whilst there are no hard and fast rules, and depending on how much growth the forecast includes, Fitch has typically found that the central case may be appropriate for its base case, but it can be too optimistic for its rating case. On the other hand, Fitch has found that the downside case may be too pessimistic. Consequently, Fitch's rating case will incorporate adjustments to base-case assumptions and will reflect a scenario with due consideration to historical data and a combination of market advisor's "central" case and "downside" case. In some cases this may be the mid-point between the two.

How does Fitch approach completion risk of EfW projects?

Similarly to the more traditional thermal power projects, EfW projects involve a capital and labour-intensive construction process. Construction complexity will be higher for projects that employ less proven technology. The risk is best mitigated by a comprehensive EPC contract that is price and date-certain with credible experienced contractors. Fitch's approach to completion risk is explained in the *Rating Criteria for Infrastructure and Project Finance*. The analysis will focus on construction complexity and scale, contractor expertise and the implementation plan, construction contract terms and availability of replacement contractors. The rating(s) of the construction counterparty(ies) will also be an important consideration for projects with completion risk, although they may not necessarily constrain the ratings of the projects using established technologies.

Does Fitch approach EfW projects subject to PPP/PFI frameworks differently?

A feature of Public-private partnership (PPP)/Private Finance Initiative (PFI) style projects is that their assets generally revert to the public-sector grantor on termination of the project agreement (whether early or on expiry), leaving whatever remaining useful life exists with the grantor. Where instead the assets are owned outright by the project company, the owners may be able to derive additional value from any remaining useful life. Generally speaking, Fitch will not give credit to this additional economic life tail, since it makes no difference to the likelihood of a payment default and our project-finance debt ratings do not incorporate recovery prospects.

The exception to this is where the credit is not scheduled to fully amortise within the term of the concession, at which point we would analyse the refinancing risk and the potential to refinance and repay the remaining debt within the remaining useful life.

Can EfW credits achieve investment-grade ratings?

Fitch has no formal cap that applies to EfW and EfW-like ratings, and Fitch has rated some such credits in the investment-grade category. These projects demonstrated sound revenue generation strategies with revenue risk assessed at least Midrange and robust financial metrics. In case of exposure to market prices (whether for feedstock or for produced outputs), projects achieving investment-grade ratings demonstrated sufficient financial cushion that allows them to withstand significant cash-flow volatility.

What are the examples of Fitch's ratings?

Fitch's EfW and biomass project debt ratings' portfolio is relatively small and consists almost exclusively of privately rated transactions. The following table provides some examples of current and previously assigned ratings. The highest rating achieved to date has been 'BBB', with the lowest at 'CCC'. Many projects have been rated in the 'BB' and 'B' range due to mostly weaker assessments of supply risk arising from concerns over feedstock availability or pricing in combination with weaker debt metrics. Revenue risk has been less of a rating constraint in our portfolio. There is a general deterioration of the key risk factor assessments, as well as metrics, from the 'BBB' credit on the left hand side to the 'CCC' one on the right.

Mission Economic Development Corp. (Dallas Clean Energy McCommas Bluff LLC)'s revenue bonds ('BBB-'/Stable) achieved an investment-grade rating despite having Weaker assessment of supply risk. The project is highly dependent on the accuracy of the landfill gas (LFG) recovery forecast and the level of interference from landfilling operations, which are currently restricting the project's output leading to an assessment of supply risk as Weaker. LFG recovery estimates have been revised several times since the original projections due to drought, landfilling timing lags, and fluctuating refuse placement within the project site. Supply risk is partially mitigated by the active nature of a landfill site that is permitted to remain open well beyond the tenor of the project debt.

Fitch Ratings of EfW and Biomass Credits

Rating Issuer	BBB Project 1	BBB- Dallas Clean Energy	BBB- Project 3	BB Project 4	B+ Project 5	B Project 6	CCC Project 7
Project type	Mass-burn	Landfill Gas	Landfill Gas	Biomass (Waste Wood)	Biomass (Agricultural Wastes)	Biomass (Wood products)	Pyrolysis (SRF)
Completion risk	n.a.	n.a.	n.a.	Midrange	n.a.	n.a.	Weaker
Operation risk	Midrange	Midrange	Midrange	Midrange	Weaker	Midrange	Weaker
Supply Risk	Midrange	Weaker	Weaker	Weaker	Weaker	Weaker	Weaker
Revenue Risk	Midrange	Midrange	Midrange	Weaker	Midrange	Weaker	Weaker
Debt structure	Midrange	Stronger	Midrange	Stronger	Midrange	Weaker	Midrange
Financial profile (Fitch rating case)	Ave DSCR 2.1x	Ave DSCR 1.8x	Ave DSCR 1.7x	Ave DSCR 1.5x	Min PLCR 1.00x	Ave DSCR 1.4x	Ave DSCR 0.8x
Note				Completion risk not a constraint	The PLCR was used as this project is subject to a partial cash sweep.	Despite the relatively strong metrics, the project is weighed down by weak revenue risk	

Source: Fitch

Related Research and Criteria

Thermal Power Project Rating Criteria (June 2018)
Rating Criteria for Infrastructure and Project Finance (July 2018)
Trends in Global Power Sales Contracts (May 2018)
Dallas Clean Energy McCommas Bluff, LLC (December 2017)

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