

COMBINED HEAT AND POWER: PROJECT DEVELOPMENT PROCESS

There is a growing interest among municipal entities operating wastewater treatment plants (WWTPs) to improve the energy and operational efficiency of these facilities. This is prompted by the need for municipalities to cut costs and contribute to global and national efforts to reduce greenhouse gas (GHG) emissions.

Anaerobic digestion sludge treatment and combined heat and power (AD/CHP) projects address wastewater treatment, independent power production and renewable energy objectives that should be included in the Municipality's Integrated Development Plan (IDP). The municipal officials that wish to develop AD/CHP projects will have to ensure that these objectives are included in annual performance plans or relevant internal planning processes in order to support the project development process.

AD/CHP projects require highly specialised technologies, and two South African municipalities (the City of Johannesburg and eThekweni Municipality) that have embarked on projects using these technologies have opted for long-term “design, build, operate and maintain” – “DOBM” project structures.

Based on the experience gained in developing a biogas-fuelled CHP project in the City of Tshwane and past projects at the City of Johannesburg and eThekweni Municipality, the aim of this factsheet is to share ideas towards creating the most optimal process to follow to establish projects of this nature.

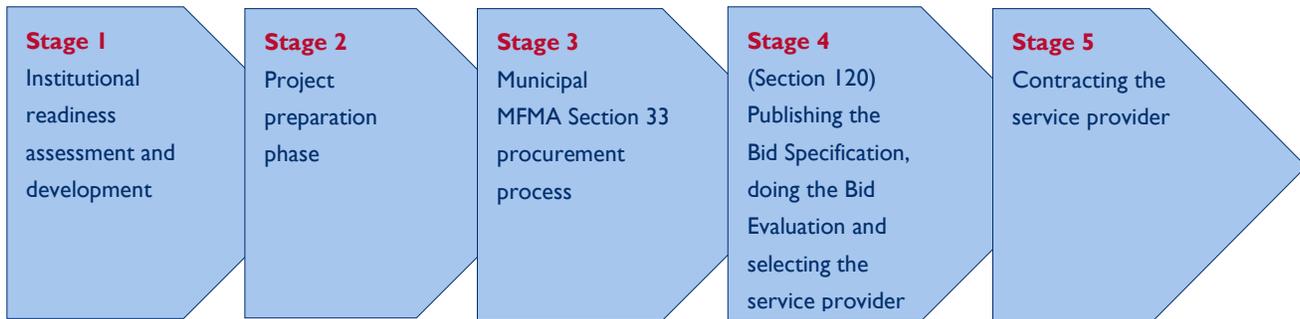


This is part three of a four-part factsheet series based on lessons learned from a feasibility study and project development process for a combined heat and power project at the City of Tshwane's Zeekoegat Wastewater Treatment Plant and existing projects at the City of Johannesburg and eThekweni Municipality.

The following factsheets and additional resources in this series can be found on [Climatelinks.org](https://climatelinks.org).

- [Overview](#)
- [Ideal Design & Structure](#)
- [Project Procurement](#)
- [Case Study](#)
- [CHP GHG Calculator](#)

It is suggested that such projects should be developed in five stages, as follows:



STAGE I **INSTITUTIONAL READINESS ASSESSMENT AND DEVELOPMENT**

Embarking on a longer-term project requires the municipality to contract according to the requirements set out in Section 33 of the Municipal Finance Management Act (MFMA); this necessitates a longer and what is generally perceived to be a more complex and onerous contracting process by both municipal officials and project developers.

The increased complexity of the contracting process requires the project development officials, or the department involved to inform and seek project approval from the executive and political (Municipal Council) decision-makers on the benefits of the project/technology, as well as the benefit of long-term contracting for the project in question.

A project team consisting of officials from multiple departments should be established to carry out the operational project development activities. The team should also report to a steering committee to ensure that the project maintains its strategic intent. It is important that the steering committee should be represented by municipal departments that will be impacted by the project (e.g., Financial Services, Supply Chain Management (Legal Services), Environmental Management (Waste), Electricity, Water and Sanitation, etc.) and that will contribute to the municipal Council approval process. Some municipalities have project management units (PMUs) which could be part of the project.

The Zeekoegat feasibility team suggests that the Water and Sanitation Department's Wastewater Treatment Operations section should take the lead in the project development process, for the reason that an AD sludge treatment and CHP will impact the sector's operation directly, where the impact on the Electricity Department might be indirect. The project should then be closely supported by the Electricity Department, but not be limited to it.

The project team should be led by a suitably qualified individual (or champion), with the authority and decision-making responsibility to ensure the project team works together across municipal divisions. This champion should be able to drive, manage, and coordinate the internal processes and communicate effectively.



STAGE 2

PROJECT PREPARATION PHASE

The project team should initiate a series of evaluations to determine the level of technical and financial viability that could be achieved with AD/CHP projects in the municipality, and more specifically at WWTPs. This investigation could either be done by internal resources or by appointing suitably qualified external resources. Based on the experience gained with the Zeekoegat CHP project development process, these investigations require technically skilled resources with a high-level of experience in anaerobic sludge treatment and combined heat and power operation and design, and the operation of the complete sludge train, as well as financial modelling skills to determine the affordability of the identified projects.

The main factors that should be considered are the existing AD infrastructure and the serviceability of the existing infrastructure; the need to comply to wastewater discharge requirements could prioritise AD developments.

The project team will present its findings to the steering committee, which will recommend whether AD/CHP projects should be considered; and if considered, which projects should receive priority. Approval to continue will be secured from municipal decision-making structures.

The investigation will then proceed to full feasibility phase at which time the investigation will include a detailed analysis of the biogas/CHP potential of the works, based on historic inflow data, actual sample analysis of the feedstock availability, and whether an optimal AD/CHP operation could be achieved. The biogas/CHP potential and the estimated capital expansion would be used to construct a financial model to determine the financial viability and the affordability of the project for the municipality.

The outcomes of the feasibility analysis will inform the development of the bid specification – this will specify the scope of work of the long-term “design, build, operate and maintain” project. It is proposed that the contract should be limited to the operations and maintenance activities of the plant and that the ownership of equipment should remain with the municipality, as this structure does not require the project to apply for a power generation license, which will significantly reduce the complexity of the project.

In addition, the bid specification should not be overly onerous, to allow for new innovations to be included in the contractor’s design of the solution. The main objective of new innovations is to allow for higher performance without reducing the financial viability of the project. The affordability of the technology applied, in combination with meeting the regulatory requirements for wastewater treatment, sludge disposal, and embedded electricity connection, among other considerations, will guide the applicability of innovations.



STAGE 3 THE SECTION 33 PROCESS

Section 33 of the MFMA allows a municipality to enter into a contract which will impose financial obligations on the municipality beyond the three years covered in the annual budget process. But this allowance will only apply if the municipal manager:

- a) publishes the **draft contract** and an **information statement** summarising the municipality's obligations in terms of the proposed contract; and
- b) initiate a **public participation process** with the local community and other interested groups or individuals to comment on the proposed contract.

The municipal manager is also required to submit the proposed project information to National Treasury and the National Department responsible for local government for approval. These two activities must be initiated 60 days prior to the meeting of the municipal council where the contract will be approved.

It is critically important to ensure that the feasibility information is packaged in a manner acceptable for submission to National Treasury and the National Department responsible for local government, and that the team that will present the municipality at these submissions is well-prepared and capable. If the team fails to convince National Treasury that the project will be affordable to the municipality, the approval process will fail.

Therefore, the Project Champion should be someone who is willing to go through this process, as the main fears are around the public participation process, competitive bidding, and seeking council approval.



STAGE 4 PUBLISHING THE BID SPECIFICATION, DOING THE BID EVALUATION AND SELECTING THE SERVICE PROVIDER (BID ADJUDICATION)

Competitive procurement, including Public Private Partnerships (PPPs), must also comply with Section 120 of the MFMA and the following:

- ✓ **Bid Specification:** This is informed by the outcome of the feasibility and council resolution.
- ✓ **Bid Evaluation:** A comparative evaluation of bids received against the bid specification.
- ✓ **Bid Adjudication:** The Supply Chain Management Department strictly administers this process and no interference by any other individual is allowed in this process.

As soon as the municipal council has approved the project, the bid specification can be published. The municipality should invite potential contractors to a bid briefing session through advertisements and

publishing a notice in the bid section of the municipality’s website. At the bid briefing session, the technical, financial and contractual information relevant to the project should be discussed in detail, and contractors should be afforded the opportunity to comment and clarify uncertainties.

The longer-term “design, build, operate and maintain” project requirement could be complex and will require a more diverse skills base from the contractor; for this reason, the municipality needs to take care to ensure the contract information is disseminated clearly.

The downside of including plant design in the contract specification, and of allowing for diverse and innovative technology offerings in the bid submission, is that contractors could offer solutions which are not easily comparable. The municipality will therefore have to allow for a strong technical bid evaluation capability. The technical bid evaluation team will submit its technical recommendation and the associated risk analysis to the official municipal Bid Evaluation Committee (BEC), which will evaluate the bid submissions and send a report and recommendations to the Bid Adjudication Committee (BAC).



STAGE 5 **CONTRACTING THE SERVICE PROVIDER**

Valuable lessons have been learned from the way in which contracting was managed at the City of Johannesburg for the Northern Works CHP project, and for some of eThekweni Municipality’s landfill gas-to-electricity projects, and for this longer-term “design, build, operate and maintain” project type, a multi-phased approach to structuring project contracts for execution would be best. Please refer to the “CHP Procurement” factsheet for more details on this multi-phased approach.