*WTE: Waste-to-Energy with Appropriate Combustion Control

Manual for Planning, Formulation, Evaluation and Contract Management of WTE-ACC project (PFEC Manual Ver. 6.1)
Under Activity 1-6

JCC December 14, 2022 @ Joy Nostalg, Pasig City

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The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

Today's contents

1. ***Background and Objective of PFEC Manual***
2. ***TOC of PFEC Manual v.6.1***
3. ***Contents of each chapter,***

1. Background and Objective

❖***LGUs in the Philippines don't have the experience*** *to plan, formulate, procure, contract and monitor a WTE-ACC facility,*

❖*Objective: To provide a* ***practical guide*** *to LGUs who don`t have the experience, and enable them to* ***address such challenges,***

❖*It discusses* ***how to evaluate unsolicited proposals*** *for WTEs,*

2. Table of Contents of PFEC Manual v6.1

Ver.6.1

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- 1.2 Objective of the Manual (for the development of WTFs)
- 1.3 Consignment of Professional Engineer — APPENDIX A
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Chapter 6 Dismantling of WTE-ACC
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- A: Consignment of Professional Engineer
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- C: General Structure of WTE/WTF
- D: WTE-ACC as a Stable Power Source Cases in Japan
- E: Safety Measures — APPENDIX D
- F: Responsiveness to Disaster Waste

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3. Contents of manual version v6.1

The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

1. ***Rationale:*** provides background and objective of formulation of this manual,
2. ***Planning Phase:*** whose main message is planning tagged with budgeting plan, is the most important factor to implement WTE/WTF project, so this chapter covers long-term MSW management master plan (10-year SWM plan), and specific project conceptual plan. One of the important elements of conceptual plan, selection of candidate site for WTE/WTF, is also discussed,
3. ***Formulation Phase:*** covers a lot of factors associated with the project formulation. Technology selection, target waste quantity/quality identification as the technical aspects, financial model and business scheme formulation as financial aspects, appropriate public-private role demarcation and value chain analysis are also important in the legal aspect. All of these aspect shall be sorted in the Feasibility Study before entering into the bidding process. Success of bidding process really depends on the quality of FS.
4. ***Evaluation Phase:*** is a break chapter where there is discussion on how to evaluate one or more unsolicited proposals raised from private entities.
5. ***Contract Management Phase:*** covers how LGUs shall supervise the design and construction works to be done in the construction sub-phase as well as monitor the operational performance in the operation sub-phase. Considering most of WTE projects will be done by BOT/BOO scheme, it is also important to know how much intervention can be appropriate for the investor's specification documents to the EPC/O&M contractors.
6. ***Dismantling of WTE-ACC:*** shows the explanation of dismantlement of WTE facility in Japanese case. It is 15 to 20 years from now so just show the example in Japan.
7. ***Appendix:*** contains a lot of examples and suggestable issues associated in the development of this guide.

Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

EJEC

1. Rationale
2. Planning Phase
3. Formulation Phase
4. Evaluation Phase
5. Contract Management Phase
6. Dismantling of WTE-ACC

Appendix

Chapter 1 Rationale
- 1.1 Background
- 1.2 Objective of the Manual (for the development of WTFs)
- 1.3 Consignment of Professional Engineer
- 1.4 Access to the Project Development Finances
- 1.5 Definitions
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Chapter 1. WtE Standard Project Procedure – as Activity 1-7

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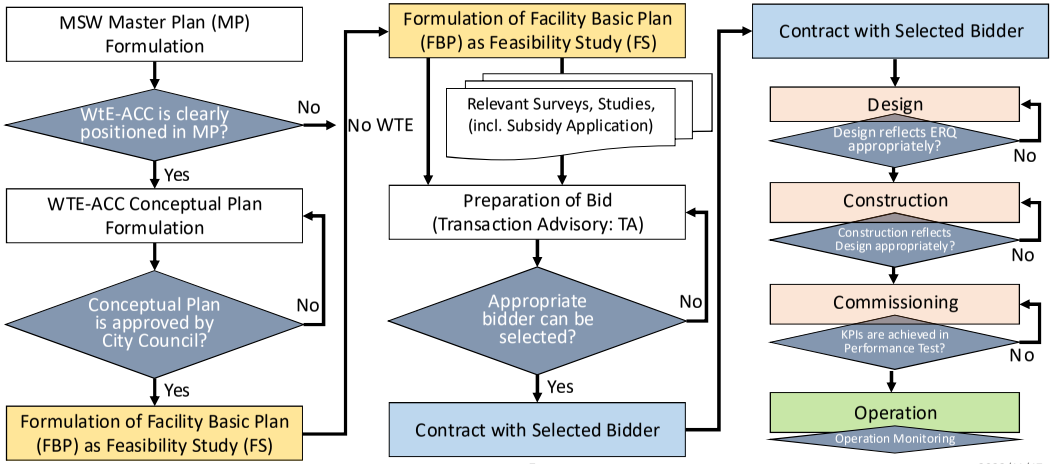

Chapter 1. Rationale: Overall Timeline (in the case of Japan)

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- ❖ The table shows the typical timeline for the introduction of WTE facility in the case of Japan.
- ❖ Construction of WTE usually takes 3-4 years including the design, construction and commissioning stages. Afterwards, commercial operation can start.
- ❖ The total process from Master Plan to commercial operation usually takes 10 years. However, if necessary surveys, studies, and decisions can be done in parallel and appropriately, some portion of the time can be shortened.

	Year	1	2	3	4	5	6	7	8	9	10	11	Remarks
New Facility	MSW Treatment Master Plan (MP) (10 year SWM Plan - Chapter 2)												Reviewed once every 5 yrs
	Facility Conceptual Plan												Decision on renewal & site
	F/S (Facility Basic Plan - Chapter 3)												Decision on processing method
	Business Scheme Study (PFI/PPP Applicability Study - Chapter 3)												Decision on business scheme
	Topographic Survey												Reflected in facility basic plan
	Geological Survey												Reflected in facility basic plan
	Environmental Impact Assessment												1.5-4 yrs
	Bid/ Selection of Winning Bidder												standard 2 yrs
	Construction Work (Chapter 5)							Construction					standard 3-4 yrs
	Operation (Chapter 5)											Start	

1. Planning Phase
2. Formulation Phase
3. Contract Management Phase
+ Unsolicited Proposal

Chapter 1. Consignment of Professional Engineer for WTE

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- ❖ WTF/WTE take place once every 20-30 years for each LGU, it is not realistic to place engineering experts in the LGU for these projects,
- ❖ Therefore, most of LGs in Japan employ waste treatment specialists who are well-versed in procedures to develop a facility as well as being familiar with laws and technologies in the field,
- ❖ Consignment items for Waste Treatment Consultants (below) and selection criteria (experience for similar projects, licenses) are introduced.
- ❖ So far, there is no project in Philippines, for short term, international experienced consultant is recommended.

a. Drafting a Waste Treatment Master Plan;
b. Drafting a Waste Treatment Master Plan for clustered LGs;
c. Drafting a Waste Collection/Transportation method;
d. Selection of candidate construction sites;
e. Drafting a plan for application for subsidy on WTF from the central government;
f. Surveys (e.g., topographical surveys, geological surveys, soil surveys, groundwater surveys);
g. Analysis (e.g., waste compositions, exhaust gas, wastewater);
h. Drafting a conceptual plan for WTF;
i. Comparative consideration of different treatment/processing systems;
j. Drafting a basic plan for the WTF;
k. Consideration of the business method
l. Survey for the possibility of Private Finance Initiative (PFI)/Public-Private Partnership (PPP) introduction;
m. Environmental Assessment (Status Survey);
n. Environmental Assessment (Impact assessment);
o. Support for the integration of the facility into urban land-use plan;
p. Cost-benefit analysis;
q. Design the WTF;
r. Transaction advisory for PFI/PPP project procurement;
s. Supervising the construction process;
t. Provide support for long term operating contracts;
u. Operations and Maintenance (O&M) Management monitoring (maintenance costs evaluation);
v. Drafting disaster waste treatment plan;
w. Conduct performance inspection of facility equipment;
x. Drafting plan to prolong life cycle of the WTF;
y. Deposition of the property of the WTF; and
z. Designing and supervising the dismantling process of WTF.

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1. Planning Phase

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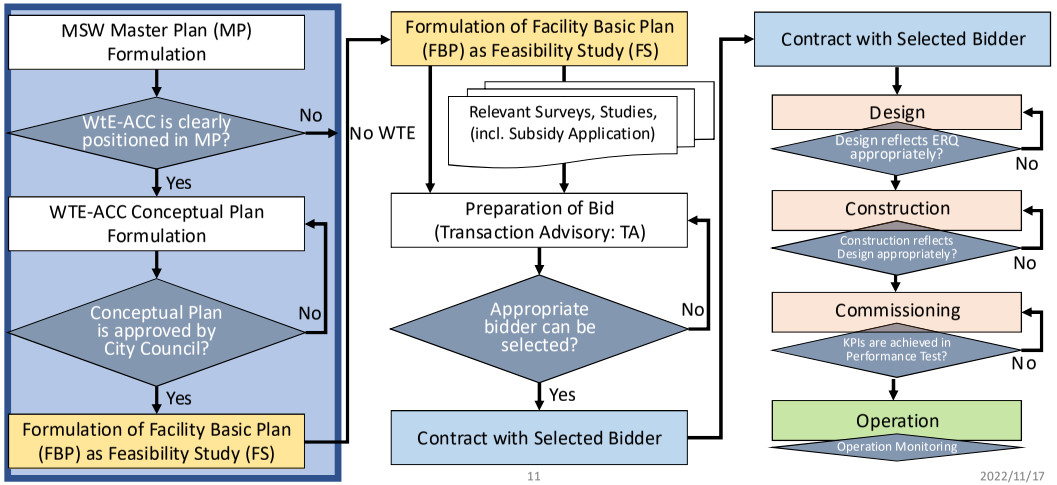
WtE Project Procedure



1. Planning Phase

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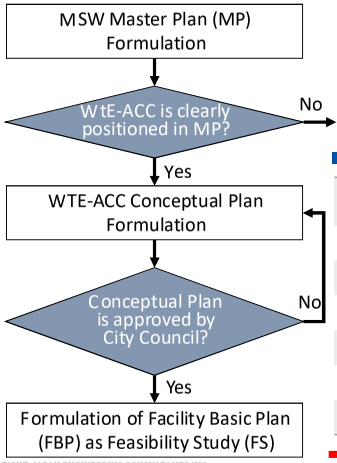
(1) Procedure of WtE Project Planning



Since the Law clearly stipulates that "Local government is responsible for Waste treatment", even if LGUs contract out some parts to private, LGUs are still primarily responsible for waste. Therefore, WtE Project shall be led by local governments.

■ What to be decided by LG in Planning Phase

• Ideal state of waste management	⇒	Set Political Priority for Zero Waste (100% material recovery) or Heat Recovery (WtE-ACC) considering recyclable market, land
• Setting the service provision area	⇒	Single municipality or wide-area union (clustering)
• Current and future waste volumes	⇒	Target volume for WtE, how to handle plastics,
• Set up capacity of a WTE-ACC (t/day)	⇒	Annual Target waste volume for WtE ÷ Operating days
• Project Formulation Timeline	⇒	For EIA ( ) yrs, Bidding ( ) yrs, Construction ( ) yrs, *Should be set in practical manner.
• Appropriate Site Selection	⇒	Urban or Suburb, next to landfill, etc. *Recommend not to rely on private land.
• Appropriate Capital and Operational Cost estimation	⇒	Market cost based on precedent studies

➡ The WTE-ACC Conceptual Plan must be approved by City Mayor/Council.

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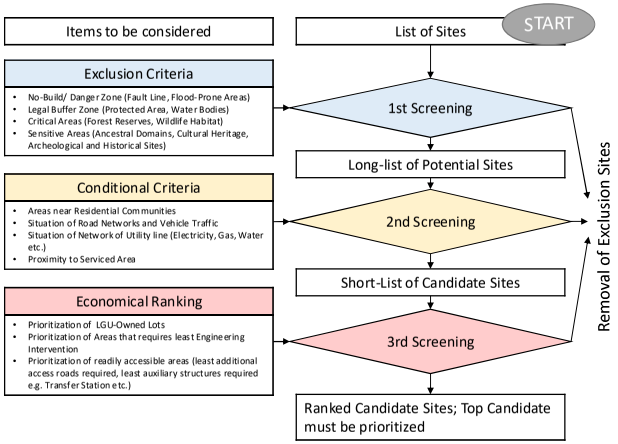
1. Planning Phase

(2) Recommended Site Selection Procedure for WtE (Tentative)



- *JET tried to combine **some WTE site selection procedures used in Japan** and **the SLFs site suitability assessment flow of NSWMC2013-64** as left.*
- *From the list of candidate sites, areas which are prohibited by law for the WTE-ACC construction are excluded in 1st Screening as mandatory exclusion criteria, supported by GIS, etc.*
- *After that, some conditions set force by the LG and local residents will be removed in the 2nd screening.*
- *Finally, the evaluation of cost attached to the shortlisted sites will be carried out. An additional iteration of screening considering cost/financial prior to final site ranking is recommended.*

➡ Transparent and Public Involved Process shall be required bcs WTE is NIMBY.

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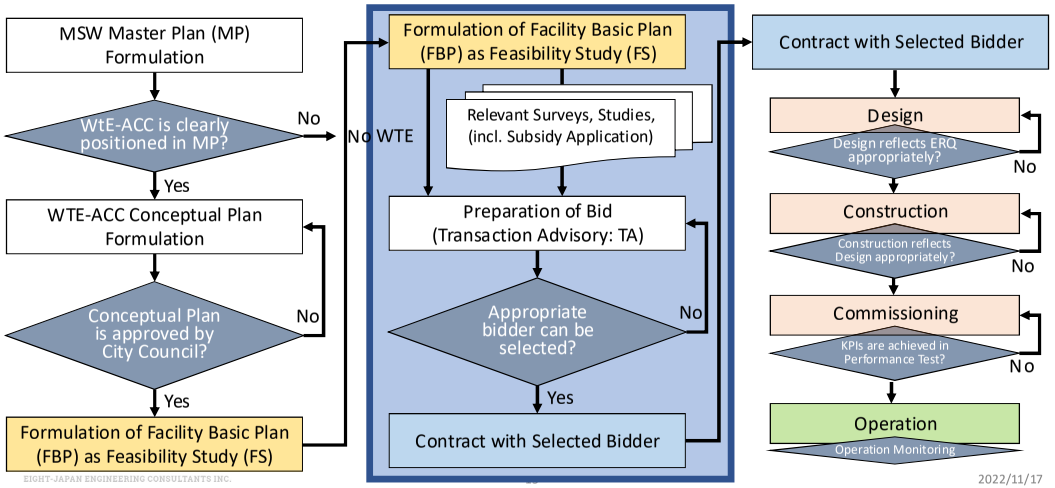
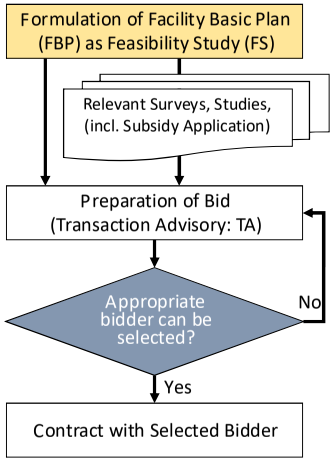
3. Formulation Phase

(1) WtE Project Procedure



3. Formulation Phase

(2) Facility Basic Plan as LGU oriented Feasibility Study



■ What to be decided by LG in the FS Phase

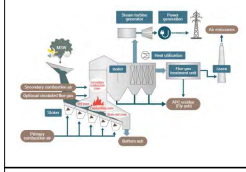
Technical	• Treatment Technology Selection	⇒ Thermal (Stoker, fluidized bed or gasification, etc.), or Non-thermal (Biomethanation, etc.)
	• Quantity / Quality of WTE Feedstock	⇒ How much MSW can be "continuously" supplied to WTE? ⇒ How much LCV can be guaranteed? (This is out of control of private proposer)
	• Pollution Control Standards (Exhaust gas, Wastewater, Residues, etc.)	⇒ Under Clean Air Act (National Standards), International Standards, and/or Stricter Voluntary Standards? ⇒ Monitoring frequency shall also be identified.
Financial	• Business Scheme	⇒ Study on applicability of PPP modality (BOT, BOO or DBO, Concession, JV, etc.)
	• Project cost estimation (Capex/Opex), Financial Model, Financing Plan	⇒ Total cost, amount of funds to be procured …
Project Boundary	Role demarcation (Scope of Work)	⇒ Basic concept of task demarcation shall be identified at this phase so that **gov. budget can be forecasted**.
	Value Chain Analysis (Treatment Process flow for upstream/ downstream)	⇒ Upstream arrangement (Segregation classification, pretreatment, how to deliver segregated waste, etc.), ⇒ Downstream arrangement (Handling of bottom ash and fly ash, disposed at TSD? Monofill?)

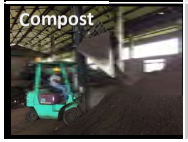
➡ Since there are NO "Zero T/F" WTE projects in the World, LGU shall concept out what LGU can provide and what LGU expects to Private Operator, in such aspect, security of annual expenditure for T/F through project period must be the most important point.

3. Formulation Phase

(3) Technical : Technology Selection

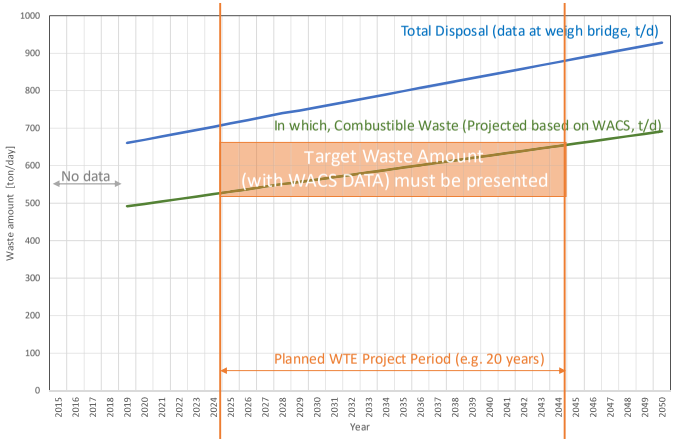
➡ Which kind of system is the most appropriate to address LGU's needs?
➡ It is necessary to avoid to choose "un-proven" technology/provider.

Thermal / Stoker Incinerator	Thermal / BFB Incinerator
	
• Widely applied in the world, • Mechanically driven stoker grates sequentially dry, combust and post-combust the waste for 1 to 2 hrs. • Bottom ash falls into the ash water-sealed conveyor from the tail end of the stoker together with the incombustibles, and after cooling, it is discharged by a conveyor. • Dust (fly ash) which captured in the exhaust gas treatment system contains poisonous components shall be collected, and treated before disposal.	• Widely applied in the world. • Crushed waste is fed into the fluidized bed of hot sand and dried, burned, and post-combusted almost at the same time (up to a dozen seconds). • The ash is discharged from the upper part of the furnace together with the combustion gas and collected as fly ash in the gas cooling chamber and dust collecting equipment.

Other MSW Treatment System	Explanations
	• A technology which the biodegradable waste is anaerobically fermented and obtain combustible biogas, • Segregated food waste will be crushed and separated to biodegradable fraction and non-bio fraction. Biodegradable fraction will be fed to digester after pulping, fermented in the digester for 3 weeks then collect digested gas (biogas), • Captured biogas can be used for fuel and digested sludge can be utilized after drying. Quantity of sludge might be the problem.
	• There are serval RDFs, following explains about RDF fluff; • A technology which the combustible waste is shredded and wrapped to be the alternative fuel, • Segregated paper and plastic waste will be further separated manually in the conveyor and air separator. Light combustible fluff will be shredded and wrapped as a cube shaped fuel (RDF fluff), • RDF fluff can be used as fuel at cement kiln, or WTE facility.
	• A technology which the biodegradable waste is aerobically fermented and converted to compost, • Segregated food waste will be manually separated, mechanically crushed (< 5cm) and piled up around 2.5m, add micro- organism for fermentation, • Pile will be mixed by wheel loader once in a couple of days and aged for 60 days. • Matured compost will be sieved by trommel to be the products,

3. Formulation Phase

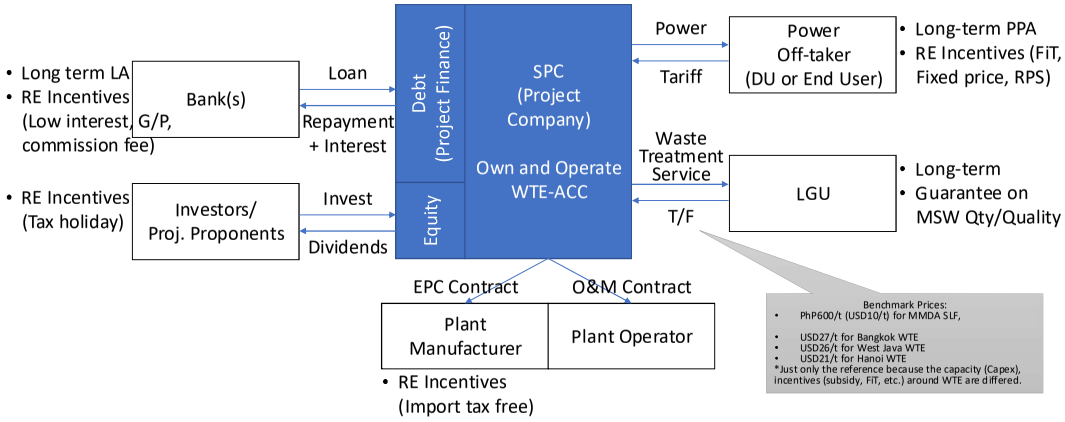
(4) Technical : Quantity and Quality of Target Waste (to be fed to WTE-ACC)



- **The planned waste amount is the basis for setting the scale/size of the facility,** and is important for the prediction of future amount, and must have high accuracy.
- This Planned waste amount (t/d) x Tipping Fee (PhP/t) must be budgeted in annual basis.
- Considering the recent plastic ban and plastic recycling tech innovation, several scenarios shall be developed and reflected to the WTE project FS.
- **In the PPP Contract for WTE, waste quantity as well as quality (LCV) usually guaranteed by LGUs.**

3. Formulation Phase

(5) Financial : Business Model (Case of BOT/BOO)



➡ To ensure "Bankability" of the Project which is composed of "Financial Viability", "Risk Optimization" and "Contractual Robustness"

3. Formulation Phase

(6) Financial : Business Scheme / PPP Modality

PPP Modalities		Role					Owner of Facility			Explanation
		Construction Period			Operation Period		Const. Period	Op. Period	After Op. Period	
		Design	Const.	Finance	Op.	Mt.				
PFI	BOO	Private	Private	Private	Private	Private	Private	Private	Private	PFIs cover BOO/BOT/BTO, which Private sector raise funds, design, construct, and operate the facility thru project period. [BOO] Ownership will not be transferred to the public even after the operation period. [BOT] Ownership will be transferred to the public at the end of operation period. [BTO] Ownership will be transferred to the public after completion of the facility.
	BOT	Private	Private	Private	Private	Private	Private	Private	Public	
	BTO	Private	Private	Private	Private	Private	Private	Public	Public	
Non-PFIs	DBO	Public	Public	Public	Private	Private	Public	Public	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, operation of the facility to the private.
	DBM	Public	Public	Public	Public	Private	Public	Public	Public	The public sector raises funds through bonds and grants, and comprehensively outsources the design, construction, maintenance of the facility to the private.
	Public Build + long term O&M contract	Public	Public	Public	Private	Private	Public	Public	Public	The public sector designs and constructs the facility, and the private is entrusted with the operation for multiple years.

3. Formulation Phase

(7) **Project Boundary :** Role Demarcation / Scope of Work in ASEAN BOT

Category	No	Role	Gov.	SPC
Land Acquisition	1	**Project Site and water supply facility**	✓	
Design and Construction (including commissioning & testing)	2	MSW Acceptance Facility (Weighbridge and Registration Office, etc.)		✓
	3	Sample sorting facility (Dumping box, etc.)		✓
	4	Processing system and visitor center		✓
	5	**Water supply piping**	✓	
	6	**Adherent Landfill and Leachate Treatment Facility**	✓	
	7	**Supporting Infrastructure (Road, rainwater drainage, etc.) in MSWM complex but outside of Waste Treatment Facility Plot**	✓	
	8	Supporting Infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓
Operation and Maintenance	9	**MSW supply to site and Unsuitable Waste removal prior to site delivery**	✓	
	10	Processing system (from MSW weighbridge until residue loading station), visitor center		✓
	11	**Water supply**	✓	
	12	**Landfill and Leachate Treatment Site operation including residue transfer to landfill**	✓	
	13	**Supporting Infrastructure (Road, rainwater drainage, etc.) in MSWM complex but outside of Waste Treatment Facility Plot**	✓	
	14	Supporting Infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓
Financing	15	**Land for Project Site**	✓	
	16	Weighbridge, Registration Office, Sample Sorting, Processing System, visitor center		✓
	19	**Water supply facility**	✓	
	20	**Supporting Infrastructure (Road, rainwater drainage, etc.) in TPPAS complex but outside of Waste Treatment Facility Plot**	✓	
	21	Supporting Infrastructure (Road, rainwater drainage, etc.) in Waste Treatment Facility Plot		✓

➡ Not fully relying on to the Private, roles where LG has specialty should be responsible for LG to secure bankability.

3. Formulation Phase

() **Project Boundary :** Role Demarcation / Scope of Work in Japanese DBO

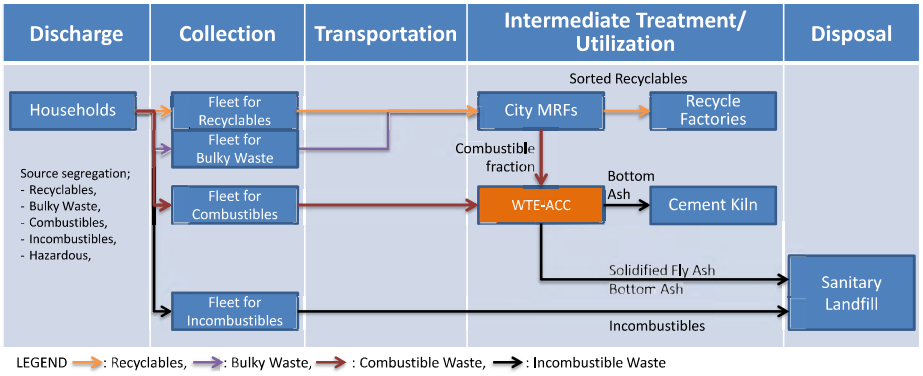
Phase	Responsibility of LG	Responsibility of Private Partner
Design and Construction Phase	✓ Security of Land ✓ Topographic Survey ✓ Geological Survey ✓ Obtain project approval from government agencies, ✓ EIA*, ✓ Application of the permission*, ✓ Supervision of Design/Construction*, etc.	✓ Support LG on Topo/Geo Survey, ✓ Support LG on the documentation for applications to gov. agencies, ✓ Design and Construction of WTE, ✓ Process and disposal of construction waste, ✓ Preparation of manuals for operation*, ✓ Provision of spare parts, etc.
Operation and Maintenance Phase	✓ Delivery of Waste Feedstock, ✓ Sales of Recovered Material, ✓ Monitoring of the operation, etc.	✓ Reception, weighing, collection of fee, ✓ Operation management (prepare plan, implement, etc.) ✓ Consumables management (prepare plan, procurement, etc.), ✓ Maintenance management (prepare plan, regular inspection, repair, back up, etc.),

Note: In DBO facility will be owned by LG so permissions including EIA usually be secured by LG.

3. Formulation Phase

(7) **Project Boundary :** Value Chain Analysis

Which parts of MSWM are you going to contract out to WTE partner? From Upstream to Downstream?

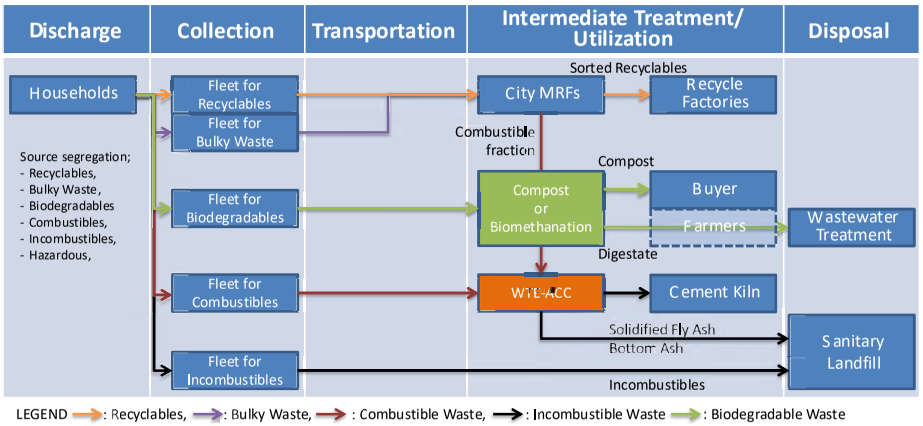


➡ Upstream arrangement (Segregation classification, segregated waste transport) is usually the role of LGU,
➡ Downstream arrangement (bottom/fly ash disposal) can be tasked to private but T/F must be increased.

3. Formulation Phase

(7) **Project Boundary :** Value Chain Analysis

Which parts of MSWM are you going to contract out to WTE partner? From Upstream to Downstream?



3. Formulation Phase

(7) **Project Boundary :** Value Chain Analysis

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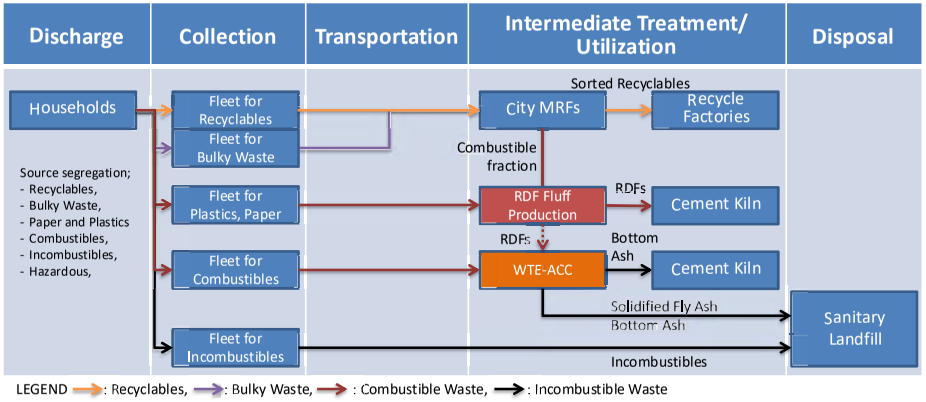

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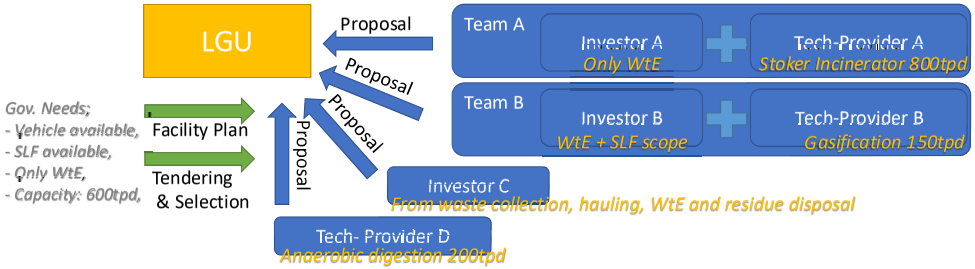
4. Evaluation of Unsolicited Proposal

- ✓ How to evaluate "Unsolicited WTE-PPP Proposal"? is one of frequently asked questions,
- ✓ Unsolicited Proposal is usually the project based on the private investor's interest in terms on scope, capital size, applied technology, while existing status and effort/achievement of LGUs in MSW management is different in LGUs, so, simply it's quite difficult to evaluate,
- ✓ Simple comparison of different schemes / types / technologies of private proposals is not make sense,
- ✓ **LGU shall have own MSW MP-based FS or even WTE-ACC conceptual plan as "NEEDS"** to ease the evaluation and/or selection of the **better** private proposal,



➡ Solicited approach is widely applied for the WTE-PPP project development in the world. If unsolicited approach will be adopted, at least WTE-ACC conceptual plan should be formulated beforehand.

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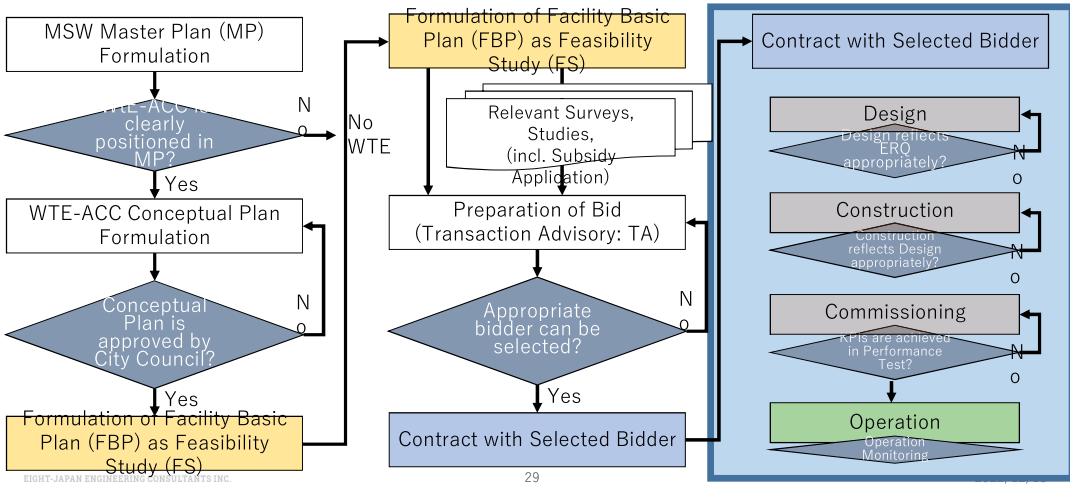
添付資料 12

5. Contract Management Phase

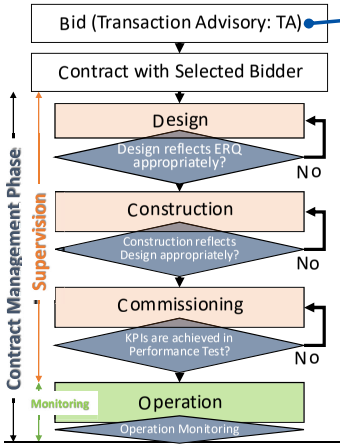
The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

(1) WtE Project Procedure



5. Contract Management Phase

(1) Procedure of Contract Management (in the aspect of LGU)



What to be specified in **"Bidding Document (Request for Proposal: RfP)"** by LG

• Selection method	⇒	Number of Envelop, Evaluation method (Merit Point, QBS, CBS)
• Instruction to Bidder (ITB)	⇒	Qualification criteria, Terms of payment, etc.
• **Employer's Requirement (ERQ)***	⇒	**Conditions of Input and Output specifications**
		Everything shall be written in here
• Evaluation criteria	⇒	Stability, economy, safety
• Contract documents	⇒	Draft basic agreement, construction/operation contract

During Contract Management Phase, it is necessary to confirm that the facility is being designed, constructed and operated as desired by LGU.
=> In many cases, employ the Independent Consultancy to check the conformity.

• Design Supervision (SV)	⇒	Review drawings for building & plant equipment
• Construction Supervision (SV)	⇒	Checking progress, witness to the inspections and tests incl. performance test

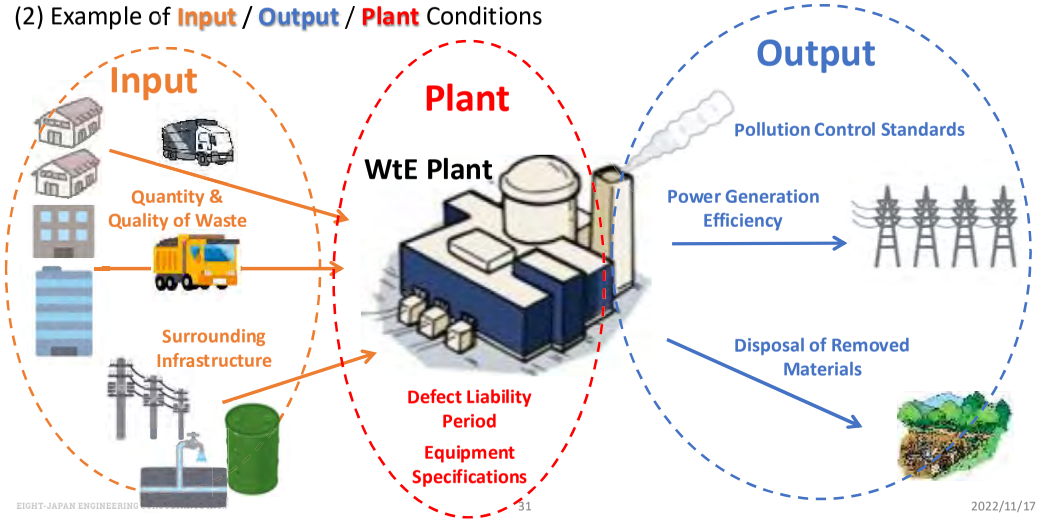
Operation Monitoring

• Compliance Status with **Employer's Requirement***	⇒	Power generation/transmission amount, Pollution control standards, etc.
• Facility maintenance status	⇒	Visual inspection, check self-inspection records, etc.

***Employer's Requirement (ERQ)** is defined as the document specifies the purpose, scope, and/or design and/or other technical criteria for the execution of the Works in FIDIC general conditions. It is used as "Technical Specification" in the Design-Build ordering system where the Employer specifies only some output/input conditions and let contractor to propose their best options.

5. Contract Management Phase

(2) Example of Input / Output / Plant Conditions



5. Contract Management Phase

(2) Example of Input / Output / Plant Conditions

Main contents of "Employer's Requirement (ERQ)" in Bidding Document

(A) COMMON	(B) CONSTRUCTION	(C) OPERATION
1. Capacity of the Facility, Project scheme	1. Quantity and quality of waste	1. Project implementation structure
2. Construction Site, Area	2. Performance Guarantee Matters;	2. Development of manuals and plans
3. Project period, time schedule	(1) Power generation efficiency	3. Operation and maintenance contents;
4. Topography and geology conditions	(2) Pollution control standards, etc.	(1) Operation management
5. Surrounding infrastructure, city planning related matters	3. Performance guarantee method	(2) Inspection, testing, repair and renewal
	4. Defect Liability Period	(3) Disposal of removed materials
	5. Equipment specifications	(4) Information management
	(1) Mechanical equipment specifications	4. Handling after the Project Period
	(2) Electrical instrumentation equipment specifications	
	(3) Civil engineering and building works specifications	

Source: Outline of WtE Technology and Requirements for WtE Project (JICA-TCP Online Training, 10Dec2021)

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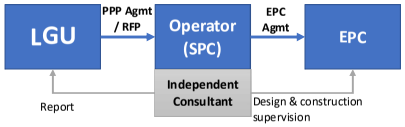
5. Contract Management Phase

(3) Relationship among LGU, Operator (SPC) and EPC contractor

Design/Construction Supervision;

- In the design/construction phase, LGU, the client of the Project, directly or indirectly through (SPC) monitor the design and construction of EPC contractor's drawings, as well as the work plan for commissioning and performance test.
- The purpose of monitoring is to confirm, **through approval and confirmation of drawings and implementation of inspections and tests, whether the construction work is planned and executed in accordance with the agreement, RFP, and the project proposal**.



Operation Monitoring;

- **In the operation phase**, the purpose of monitoring is to provide citizens with high-quality public services based on **an appropriate division of roles between the LGU and the Operator (SPC) by monitoring and confirming the implementation status of various tasks related to the operation and reflecting the results in the payment of fees.**

*Specific rules and procedures shall be designed in Contract Management Manual

➡ Even though BOT/BOO, LGU can design the level of intervention to the Private Partner's role bcs this is Public Project.

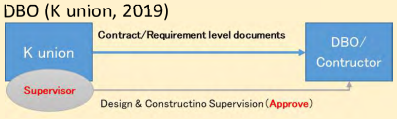
5. Contract Management Phase

Phase	Work	Contents
Construction	Design supervision	Checking whether there are any discrepancies between the requirements document/contract and the basic design/detailed design documents
	Construction supervision	Confirmation that construction work is being carried out in accordance with the requirements, contract, and design documents
Operation	Operation supervision	Confirmation that operation and maintenance are being carried out in accordance with the requirements and contract documents

5. Contract Management Phase

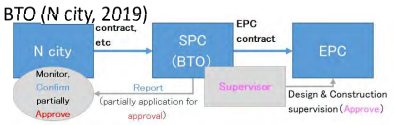
(3) Design and Construction Supervision / 4 PPP case studies in Japan

DBO (K union, 2019)



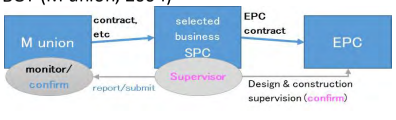
- No SPC. No monitoring on the business side.
- The union **supervisor approves** the various drawings and procedures. When the union lacks the capacity, it outsources the work.
- **The consent of the union** is a condition for proceeding to the next step.

BTO (N city, 2019)



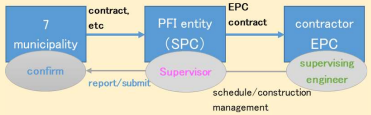
- City asks SPC to **hire supervising company**.
- The supervising company (supervisor) **approves** the various drawings.
- **Only the list of approved books and test procedures** are **approved** by the city.
- Other drawings are **reported*** by SPC **to the city**. When the city lacks the capacity, it outsources the work

BOT (M union, 2004)



- The union requests SPC to supervise the construction.
- **SPC approves** the various drawings.
- **Report and obtain confirmation*** of the approved documents from SPC to the city.

BOO (K city, etc., 2019)



- The city requests SPC to supervise the construction.
- **Supervisor of SPC approves** the various drawings.
- **Report and obtain confirmation*** of the approved documents from SPC **to the city**.

- While LGU directly supervise contractor's design and construction in DBO, LGU indirectly monitor SPC's supervisory works in BOT/BOO,
- Compare with DBO, public involvement for BOT/BOO is light touch,
- Items to be needed for the LGU's approval in BOT/BOO shall be designed and determined in the contract clearly.

5. Contract Management Phase

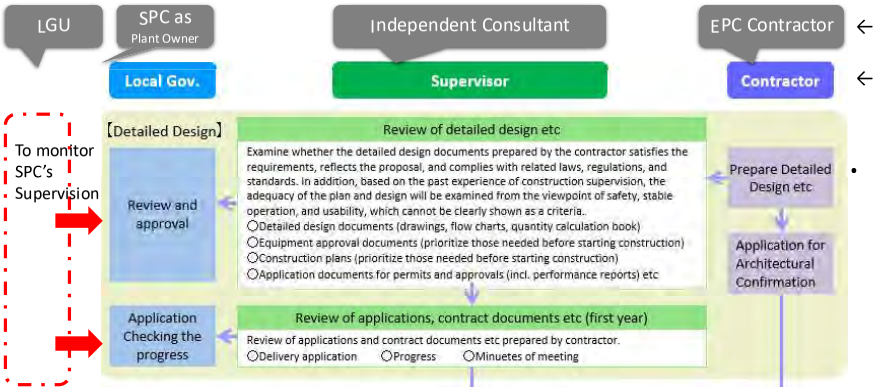
(4) Design and Construction basic approach to construction monitoring

- In general, WTE-ACC facilities are ordered under the lump-sum design-build (performance order) system, so LGU shall confirm that the contents specified in the RFP are reflected in the design documents.
- LGU shall confirm that the work is being performed in accordance with the approved design documents.
- The facilities must be developed to reflect the intentions and requirements of the client, keeping in mind that they are environmental infrastructure facilities that provide public services over a long-term operational period.
- This is a public project led by the private sector, and the private sector's ingenuity and know-how must be used to the maximum extent possible.
- Quality control must be carried out by project operators to ensure that only economic efficiency is not pursued, such as the use of poor quality materials, poor quality construction, and economic design.
- Each process must be prevented from being delayed without clear and unavoidable reasons, and the provision of public services must be prevented from being delayed.
- When applying for subsidies, etc., the progress and completion of construction must be confirmed and reported in an appropriate and transparent manner.
- The commissioning of facilities, performance tests and various inspections and completion inspections must be carried out properly in accordance with predetermined methods.

添付資料 12

3. Contract Management Phase

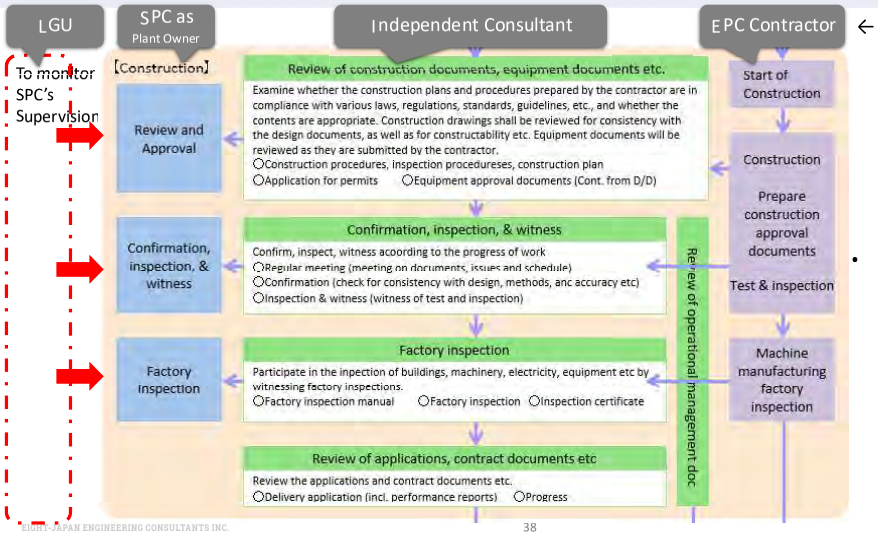
(5) **Design and Construction** Supervision /
Detail Procedure in DBO Case / and implication of BOT/BOO;



- In BOT/BOO, detail review and approval for the design documents shall be done by SPC, and LGU shall/can review such supervisory results.

3. Contract Management Phase

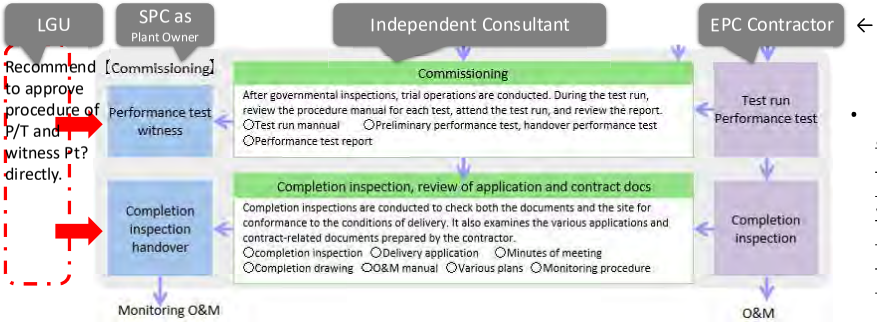
(4) **Design and Construction** Supervision /
Detail Procedure in DBO Case / and implication of BOT/BOO;



- In BOT/BOO, detail review and approval of the construction documents, inspection, witness, etc. shall be done by SPC, and LGU shall/can review such supervisory results.

3. Contract Management Phase

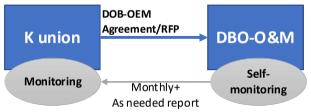
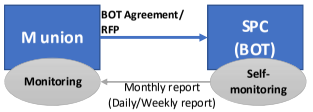
(5) **Design and Construction** Supervision /
Detail Procedure in DBO Case / and implication of BOT/BOO;



- Even in BOT/BOO, **approval of performance test procedure, and witness of performance test are recommended to be done by LGU directly.**

5. Contract Management Phase

(6) **Operation** Monitoring / 3 PPP case studies in Japan

K union DBO	M union BOT / K city BOO
	
• Submission and **Approval** of the O&M manual. • Submission and **Approval** of the annual biz plan. • **Submission and Acceptance** of monthly/annual reports. *Almost similar regulations will be applied to BTO because operation of BTO is after ownership transfer.	• **Submission** of O&M manual. • **Submission** of annual business plan. • **Submission and Acceptance** of monthly/annual reports. *"Approval" is not specifically required.

- At the Operational Phase, **there is no significant difference in the RfP documents between DBO/BTO** where LGs own facilities, and BOT/BOO where private companies own facilities.
※As shown in above, there are differences in the expressions used for "**Acceptance**" or "**Approval**".
- Same as the Design and Construction Phase, it is a considerable matter if to assign experts who can check the SPC's self-monitoring and discuss countermeasures when any problems occur.

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3. Contract Management Phase

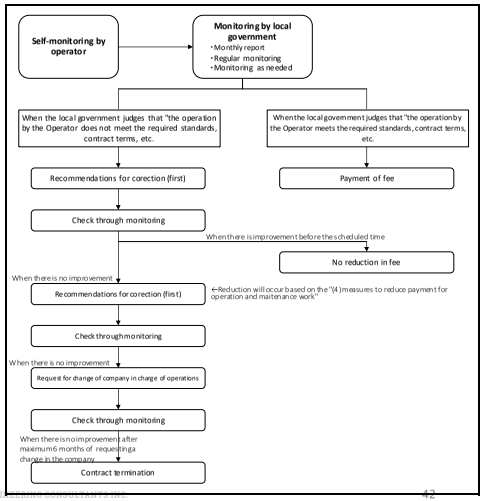
(6) **Operation** Monitoring / List of Documents to be requested to prepare to SPC

Documents to be prepared:	Manuals	Work Plans／Work Implementation Plans			Reports
Description	Procedural Standards	Work plans for the pre-determined period (all, annual, monthly) based on the requirement in Manuals			Reports correspond to the work plans
Name of Works / Period applied for	Thru Operation Period	Thru Operation Period	Annually	Monthly	* Correspond to the period in left;
1. Operational Management	Operational Management Manual				
(Operation Works)			Annual Operation Plan (AOP)	Monthly Operation Plan	Annual/Monthly Operation Report (A/MOR) *1
(Reception, Collection Charges)			(included in AOP)	(included in above)	(included in A/MOR)
(Delivery Control)	* Inspection, unsuitable MSW		(included in AOP)	(included in above)	(included in A/MOR)
(Efficient Utilization)	* Power generation and resource recovery plans		(included in AOP)	(included in above)	(included in A/MOR)
2. Maintenance Management	Maintenance Management Manual				
(Procurement)			Annual Procurement Plan	Monthly Procurement Plan	Annual/Monthly Procurement Report
(Check and Inspection)		(Overall) Check and Inspection Plan	Annual Check and Inspection Plan		Annual Check and Inspection Report
(Repair and Renewal)		(Overall) Repair and Renewal Plan	Annual Repair and Renewal Plan		Annual Reipair and Renewal Report
(Corrective Maintenance)		(Overall) Corrective Maintenance Plan			(Overall) Corrective Maintenance Report
(Functional Inspection)	*Required in Japanese reg.	(Overall) Functional Inspection Plan			(Overall) Funcitional Inspection Report
3. Environmental Management	Environmental Management Manual				
(Environmental Protection)		(Overall) Env. Protection Plan	(included in AOP)		(included in A/MOR)
(Working Environment Protection)		(Overall) Working Env. Protection Plan	(included in AOP)		(included in A/MOR)
4. Emergency Response	Emergency Response Manual	*Drafting for accident prevention, emergency contact, etc.			Accident and Disaster Reports
5. Others	Manuals for other tasks				
(Clean up)		(Overall) Clean-up Plan	Annual Clean-up Plan		Annual Clean-up Report (+every time)
(Planting Plan)		(Overall) Planting Plan	Annual Planting Plan		Annual Planting Report (+every time)
(SPC Management)		(Overall) SPC Management Plan	Annual Managemtn Plan		Annual Management Report
(Fire Prevention)		(Overall) Fire Prevention Plan	Annual Fire Prevention Plan		Annual Fire Prevention Report
(Guard Duty)		(Overall) Safety Management Plan	Annual Safety Management Plan		Annual Safety Management Report
(Residents' Response)		(Overall) Residents' Response Plan	Annual Residents' Response Plan		Annual Residents' Response Report
(Visitors' Response)		(Overall) Visitors' Response Plan	Annual Visitors' Response Plan		Annual Visitors' Response Report
(Education and Training)		(Overall) Education and Training Plan	Annual Education and Training Plan		Annual Education and Training Report

*1: Daily reports should be attached

5. Contract Management Phase

(7) **Operation** Monitoring / Monitoring and Corrective Action



- Flow of Monitoring and Corrective Action in Operation Phase (example of DBO project in Japan).
- Based on self-monitoring by business operator, the monitoring method/frequency and evaluation criteria for LGU are stipulated.
- Check-sheet (draft)

Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

Draft Manual for the Planning, Formulation, Evaluation and Contract Management of WTE Projects

添付資料 12

7. Appendix

The following sections consist of the Appendix, which highlight the examples and suggestable issues associated in the development of this guide

- **A: Consignment of Professional Engineer**
- **B: Applications/Notifications to the Governments (Example in Japan)**
- **C: General Structure of WTE/WTF**
- **D: WTE-ACC as a Stable Power Source Cases in Japan**
- **E: Safety Measures**
- **F: Responsiveness to Disaster Waste**

GUIDANCE DOCUMENT ON THE OPERATION OF WASTE-TO-ENERGY (WtE) FACILITY ON APPROPRIATELY CONTROLLED COMBUSTION

DENR–DOST–DOE JOINT ADMINISTRATIVE ORDER NO. ___
Series of 2021

In line with the mandate of the Department of Environment and Natural Resources (DENR) through the Environmental Management Bureau (EMB) to recommend policies in the elimination of barriers to waste reduction programs and to effectively strengthen the implementation of the Republic Act (RA) No. 9003 otherwise known as the "Ecological Solid Waste Management Act of 2000" and its Implementing Rules and Regulations, and to complement the DENR Administrative Order 2019-21 otherwise known as the "Guidelines Governing Waste-to-Energy (WtE) Facilities for the Integrated Management of Municipal Solid Wastes", this Joint Administrative Order (JAO) on the Guidance Document for the Operation of Waste-to-Energy Facilities on Appropriately Controlled Combustion (WtE-ACC Facilities) is hereby provided as follows:

Section 1. Purpose and Objective

This JAO is issued to provide guidance for the evaluation, establishment, and control of Waste-to-Energy Facilities on Appropriately Controlled Combustion (WtE-ACC) for the proper management of municipal solid wastes in the country.

Section 2. Scope

This JAO shall apply to all WtE-ACC Facilities that will be operated nationwide. It shall provide comprehensive set of guidelines in the form of technical checklist for the structure, operation and maintenance of WtE-ACC Facilities and the guidelines for the management of bottom and fly ash that will be generated from the said facility.

Section 3. Definition of Terms

This JAO hereby adopts the following terms which shall have the following meanings:

a) Appropriately Controlled Combustion (ACC)
b) Auxiliary Combustion Device
c) EMB
d) Continuous Emission Monitoring System (CEMS)
e) DENR
f) DOE
a) DOST
b) Residual Waste
c) Residual Waste Containment Area
d) WtE Feedstock
e) WtE-ACC Operator
f) WtE-ACC Facility

添付資料 12

Section 4. Technical Standards and Guidelines

All persons, natural or juridical, who are engaged in structural, operational and maintenance standards for WtE-ACC Facilities must adhere to the minimum standards and guidelines set out in this Section. These shall be used as the guidance on baseline in determining the minimum performance standards and specifications in WtE-ACC projects. Thus, all persons and entities engaged in relation to WtE projects and facilities shall coordinate with the respective Regional Offices of the DENR, DOE and DOST which have the jurisdiction area of operation to ensure compliance to the following standards and guidelines, to wit:

Section 4.1 General

1. Compliance with other Applicable Laws and Regulation

   All WtE-ACC facilities shall comply with existing structural requirements set forth in National Building Code (PD 1096), Occupational Safety and Health Standards (RA 11058) and other applicable regulations in terms of structural strength against self-weight, loading capacity and other loads, seismic force and temperature stress.

2. Prevention of Corrosion

   All WtE-ACC facilities shall take necessary measures to prevent corrosion caused by molten chlorides and sulphates released during combustion or high temperature chlorine attack, exhaust gas, and wastewater, generated from waste and a result of waste treatment.

Section 4.1 General

3. Fire Prevention and Control

   All WtE-ACC facilities shall meet the design conditions and requirements in accordance with RA 9514, or the Fire Code of the Philippines and Rules 9, 10 and 11 of its Revised Implementing Rules and Regulations in particular and take necessary measures to prevent fires and provide the necessary fire extinguishers and other fire extinguishing equipment.

4. Operation Stability

   All WTE-ACC facilities, whether intended to be run continuously or intermittently, shall be designed for continuous and stable operation for at least ninety (90) days or more per line

5. Effective Use of Excess Energy Generated

   All WtE-ACC facilities shall be capable to effectively use the excess heat for several purposes such as power generation, and external heat supply.

Section 4.2 Complete Combustion Control

1. Processing Capacity

   All WtE-ACC facilities shall sustain the processing capacity (in tons per day) indicated in the EIS application document. All WtE-ACC operators shall not accept waste, more than the indicated capacity in the approved ECC

   The WtE-ACC facility shall secure a new ECC, prior to expansion, should it be necessary to increase the processing capacity of the WtE-ACC facility

2. Waste Feeding

   All WtE-ACC facilities shall have a device capable of quantitatively and continuously introducing waste into the combustion chamber while being insulated from outside air

   All WtE operators shall input waste into the combustion chamber continuously in a quantitative manner in a state of isolation from the outside air

   When inputting waste into the combustion chamber by the pit crane method, ensure that waste is mixed uniformly at all times

Section 4.2 Complete Combustion Control

3. Structural Requirement for Combustion Chamber

All WtE-ACC facilities shall have a combustion chamber and ensure the compliance of the following requirements:

i. The system shall be designed such that it is possible to incinerate waste in a state where the temperature of the combustion gas is eight hundred fifty (850) degrees Celsius or more;

ii. The system should be capable of retaining the combustion gas for two (2) seconds or more while maintaining the temperature of eight hundred fifty (850) degrees Celsius or more:

iii. The system shall be isolated from outside air;

iv. The system shall keep the temperature of the combustion gas promptly raised to or above the temperature as stipulated in lette (i), and to be equipped with an auxiliary combustion device necessary to maintain the temperature; and

v. The equipment shall be installed to supply the necessary amount of the air for combustion (i.e. *Limited to those having the function of adjusting the amount of supplied air*).

Section 4.2 Complete Combustion Control

4. Operational Requirements for Combustion Chamber

The WtE Facility Operators shall:

i. Maintain the temperature of the combustion gas in the combustion chamber at eight hundred fifty (850) degrees Celsius or more

ii. Incinerate so that loss of ignition of the incinerated bottom ash is five (5) percent or less. However, this shall not apply to the case where the incinerated bottom ash is used so as not to cause hindrance to the preservation of the surrounding environment

iii. Quickly raise the furnace temperature to or above as indicated in letter (i) by operating an auxiliary combustion device when starting operation

iv. Keep the temperature of the said furnace to or as indicated in letter (i) by operating an auxiliary combustion device and burn all waste when the operation of the said facilities is to be stopped

5. Continuous Measurement and Record of Temperature of Combustion Gas

All WtE-ACC facilities shall have appropriate equipment to continuously measure and record the temperature of the combustion gas near the wall of the combustion chamber. All WtE Facility Operators shall continuously measure, record and maintain a record of the temperature of the combustion gas in the combustion chamber

Section 4.3 Exhaust Gas Control

1. Cooling System of Combusted Gas

All WtE-ACC facilities shall have a cooling facility capable of lowering the temperature of the combustion gas flowing into the dust collector to approximately two hundred (200) degrees Celsius or less. However, this shall not apply to the case where the temperature of the combustion gas can be quickly cooled to approximately two hundred (200) degrees Celsius or less in the dust collector

All WtE Facility Operators shall ensure the cooling of the temperature of the combustion gas flowing into the dust collector to approximately two hundred (200) degrees Celsius or less. However, this shall not apply to the case where the temperature of the combustion gas can be cooled to approximately two hundred (200) degrees Celsius or less in the dust collector

2. Continuous Measurement and Record of Temperature of Combusted Gas Flowing into the Dust Collector

All WtE-ACC facilities shall have appropriate devices to continuously measure and record the temperature of the combustion gas flowing into the dust collector. All WtE Facility Operators shall continuously measure, record and maintain a record of the temperature of the combustion gas flowing into the dust collector.

Section 4.3 Exhaust Gas Control

3. Exhaust Gas Treatment System

All WtE-ACC facilities shall have exhaust gas treatment systems (Limited to those with an advanced function to remove dust) capable of preventing the hindrance in the preservation of the living environment caused by the exhaust gas discharged from the chimneys of the facility shall be provided.

All WtE Facility Operators shall, in its operation, comply with exhaust gas emission standard specified in Section 19 of RA 8749 to prevent the hindrance in the preservation of the environment caused by exhaust gas, and remove soot and dust accumulated in cooling equipment and exhaust gas treatment equipment

4. Continuous Measurement of CO in Exhaust Gas

All WtE-ACC facilities shall have appropriate equipment for continuously measuring and recording the concentration of carbon monoxide (CO) in the exhaust gas discharged from the chimney of the facility:

i. All WtE operators shall incinerate waste so that the concentration of carbon monoxide (CO) in exhaust gas discharged from chimneys is one hundred (100) ppm or less (as one (1) hour average at twelve (12) percent O_2 basis)

ii. Provided, however, that this shall not apply to WtE-ACC facilities which it is inappropriate to use the concentration of carbon monoxide (CO) as an index for the maintenance of combustion in order to suppress the generation of dioxins in exhaust gas discharged from chimneys, and which measures and records the concentration of dioxins in the said exhaust gas at least once every three (3) months

iii. All WtE Facility Operators shall continuously measure and record the concentration of carbon monoxide (CO) in the exhaust gas discharged from a chimney. This continuous measurement shall be kept from the time which WtE facility starts its operation until carbon monoxide (CO) concentration could be lowered enough after the stop of operation

Section 4.3 Exhaust Gas Control

5. Emission Limit Value of Dioxins and Furans

   All WtE-ACC facilities shall incinerate waste so that the concentration of dioxins in exhaust gas discharged from chimneys is less than the concentration specified in 6.3, c) of DENR Administrative Order No. 2019-21

6. Monitoring Frequency of Exhaust Gas

   Aside from the requirements of CEMS installation for the monitoring of operation performance, all WtE-ACC facilities shall measure and record the concentration of dioxins in the exhaust gas emitted from chimneys at least once a year, and the concentration of exhaust gas (i.e. Limited to the substances related to sulfur oxides (SOx), dust, hydrogen chloride (HCl) and nitrogen oxides (NOx)) at least once in six (6) months in compliance to NESSAP under the DAO 2000-81

7. Wastewater Control

   Wastewater generated from WTE-ACC facilities including wet scrubber/s should be contained and treated in accordance with the effluent standards under the DAO 2016-08 and DAO 2021-19 Updated Water Quality Guidelines, and General Effluent Standards for Selected Parameters, respectively

Section 4.5 Management of Fly and Bottom Ash

1. Ash Management

   WtE-ACC residues such as fly and bottom ash shall be managed appropriately through the use of appropriate technologies to ensure that handling, transport and disposal is executed without exposing harm to public health and the surrounding environment of the facility.

   Ash management generated from WtE-ACC shall be primarily under the responsibility of the respective LGU, aligned to their responsibility of managing MSWM in accordance with RA 9003. LGUs can, in its waste processing contract, delegate the responsibility to the WtE Facility Operator.

2. Ash Discharge

   All WtE-ACC facilities shall have an ash discharging facility and its storage facility capable of discharging and storing fly ash separately from bottom ash. The structure of ash discharging facility shall ensure that fly ash and bottom ash do not scatter or fly out.

   All WtE Facility operators shall discharge and store fly ash from bottom ash separately.

Section 4.5 Management of Fly and Bottom Ash

3. **Toxicity Characteristics Leaching Procedure Test / Determination of Toxicity Characteristics**

   The management of the generated fly and bottom ash will depend on its classification. The ash shall be subjected to a laboratory analysis specifically Toxicity Characteristics Leaching Procedure (TCLP) and pH test to determine if it is hazardous or not.

   a) Ash Classified as Hazardous Waste

      The generated fly and bottom ash classified as hazardous wastes shall be managed in accordance with the provisions of DAO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes (Revising DAO 2004-36).

   b) Ash Classified as Non-Hazardous Waste

      The generated fly and bottom classified as non-hazardous wastes shall be managed in accordance with the provisions of DAO 2001-34: Implementing Rules and Regulations of the Philippine Ecological Solid Waste Management Act of 2000.

Section 4.5 Management of Fly and Bottom Ash

4. **Cement Solidification or Chemical treatment of Ash**

   In the case of stabilization of fly ash or bottom ash by cement solidification or chemical treatment, a kneading device capable of uniformly mixing fly ash or bottom ash, cement or chemicals and water shall be provided. In this case, fly ash or bottom ash, cement or chemicals and water shall be uniformly mixed

Section 4.6 Other Environmental Pollution Control Requirements

1. **Prevention of Noise and Vibration**

All WtE-ACC facilities shall have a structure not to generate extreme noise and vibration, nor damage the surrounding environment. All WtE-ACC Facility Operators shall, in its operation, comply with Noise Control Standard specified in NPCC MC 1980-002 and take necessary measures so that the surrounding environment will not be damaged by significant noise and vibration. Approaches in structural and site layout must be complied particularly on the waste handling operations that must be totally enclosed to contain noise.

2. **Prevention of Scattering and Offensive Odor**

All WtE-ACC facilities shall have a structure or equipment necessary for odor management. WtE-ACC Facility Operators shall take necessary measures to ensure the prevention of waste scattering and emission of offensive odor. Provision of appropriate technologies and practices to minimize odor and litter concerns should be implemented and strictly observed.

3. **Housekeeping of the facility**

All WtE-ACC facilities shall endeavor to prevent the occurrence of mosquitoes, flies, and maintain the cleanliness of the premises and surrounding areas of the facility. Provision of pest control programs to control specific vector populations and practices that reduce attracting vectors shall be implemented and strictly observed.

Section 4.7 Other Requirements

1. **Periodical Inspection**

In addition to the preceding items, all WtE-ACC facilities shall undertake the necessary measures to maintain the functions of the facility, and periodically conduct functional inspections of the exhaust gas and water quality.

2. **Record Management**

Records of check, inspections and other measures concerning the maintenance of facilities (including emergency measures) shall be prepared and retained for five (5) years in soft and hard copies.

Section 5. Duties and Responsibilities of the DENR, DOE and DOST

The DENR, DOST, and DOE shall have the following duties and responsibilities:

A. **The DENR through its Environmental Management Bureau shall:**

1. Review, assess, and evaluate all related applications prior to the construction of WtE-ACC Facilities in compliance to the existing rules and regulations;
    a. Permitting requirements under DAO 2019-21 and policies of Department of Human Settlements and Urban Settlements.
    b. Design of exhaust gas treatment system of the WtE-ACC facility under RA 8749.
    c. Installation of CEMS for the monitoring of operation of performance, measure and record of the concentration of dioxins and furans emission, and exhaust gas in compliance to NESSAP of DAO 2000-81.
    d. Monitoring and evaluation of the ash management and discharge in compliance with DAO 2013-22 and DAO 2001-34.
    e. Monitoring and evaluation of the management of wastewater in compliance with DAO 2016-08 and DAO 2021-19.
2. Provide technical support to DOST and DOE relative to the assessment, review, and evaluation of compliance to structural and operational requirements, as deemed necessary; and
3. Perform other duties and responsibilities geared towards achieving the objective of this Order.

Section 5. Duties and Responsibilities of the DENR, DOE and DOST

The DENR, DOST, and DOE shall have the following duties and responsibilities:

B. **The DOE shall:**

1. Review, assess, and evaluate all WtE-ACC Facility design/plan in compliance to all the structural and operational requirements;
2. Adapt the necessary provisions and requirements under Section 7 of House Bill No. 3423 and Section 30 of the Renewable Energy (RE) Act;
3. Provide technical support to DENR and DOST in prescribing policies and programs to enhance the electric power industry participants in the development of WTE Facilities, as deemed necessary;
4. Promote WTE facilities as base load renewable energy which can contribute to solid waste management, benefit to the local economy, and create green jobs, among others; and

- Perform other duties and responsibilities geared towards achieving the objective of this Order

Section 5. Duties and Responsibilities of the DENR, DOE and DOST

The DENR, DOST, and DOE shall have the following duties and responsibilities:

C. **The DOST shall:**

1. Review, assess, and evaluate all WtE-ACC Facility design/plan in compliance to all the structural and operational requirements;
2. Adapt the necessary provisions and requirements under Section 4 of DAO 2006-01;
3. Provide technical support to DENR and DOE as deemed necessary; and
4. Perform other duties and responsibilities geared towards achieving the objective of this order

Section 6. Separability Clause

If any provision of this JAO, or the application of any such provision to any person or circumstance, shall be held to be unconstitutional, invalid, illegal or unenforceable, the remainder of the provisions hereof that are not affected, or the application of such provision to persons or circumstances other than those as to whom or which it is invalid, illegal or unenforceable, shall not in any way be affected or impaired thereby.

Section 7. Repealing Clause

All other Orders inconsistent with any provisions hereof are hereby repealed and amended accordingly.

Section 8. Effectivity

This Circular shall take effect fifteen (15) days after the publication in a newspaper of general circulation and upon acknowledgment of receipt of a copy thereof by the Office of the National Administrative Register (ONAR).

SIGNATORIES

ROY A. CIMATU	ALFONSO G. CUSI	FORTUNATO T. DE LA PEÑA
DENR Secretary	DOE Secretary	DOST Secretary

"The Case Study Analysis for BAT/BEP Guideline"

JICA Expert Team

The Technical Cooperation Project (TCP) for Capacity Development on Improving Solid Waste Management (SWM) through Advanced/Innovative Technologies

Contents of Presentation

1. History of meetings
2. BAT/BEP Guidelines in the TCP
3. The Case Study Analysis
   1. Structure and Scope
   2. Results of Case Studies
   3. Findings

1. History of the meetings for BAT/BEP Guideline

Meeting	Date	Main Presentation/Discussion
1st SG	18 Feb. 2020	- Discussion of the target **countries** and **type of WtE** facility - Presentation of survey format for each member
2nd SG	5 March	- It was agreed that case studies mainly focus on **combustion**. - JET requested members to investigate what they are interested.
3rd SG	4 June	- Confirmation of **selection criteria and survey format** - Presentation of **4 collected cases** studies base on the survey format (Japan, Singapore, Netherland and France)
4th SG	7 July	- Presentation of summary of **15 cases**
5th SG	20 Aug.	- Presentation of summary of **36 cases**
6th SG	14 Oct.	- Presentation of summary of **46 cases**
2nd ITWG	3 Dec	- Explanation of Survey Procedure of Case Studies of BAT/BEP GLs - Presentation of summary of **60 BAT/BEP cases** (Japan:30, Asia except Japan: 10, EU and USA:20)
4th SG-(OP4)	25 March, 2021	- Submission and Explanation of the **1st draft BAT/BEP GL** (17 Mar) - Deadline for **SG members' comments** was set for the beg. of April

Meeting	Date in 2021	Main Presentation/Discussion
7th SG	23, April	- Presentation of the answer for the comments - Explanation of additional information for the comments
3rd ITWG	26, April	- Explanation of **1st draft of BAT/BEP GL** - Sharing the comments from SG members and JET answers
8th SG	14, June	- Submission of the **2nd draft BAT/BEP GL** - Deadline for **SG members' comments** was set for June 24 (→Only DOE provided a comment to supplement information of FIT)
	July	• QC submitted the letter with comments to EMB after deadline (July) →PMO/EMB responded to QC within July • PMO suggested change of the title of the document
4th ITWG	2, Aug.	• Submission and explanation of the **2nd draft as Case Study Analysis** (updated with input by DOE, the different title suggested by PMO) • Deadline for **ITWG members' comments** was set by August 13
	Aug-Sep	• QC submitted a letter with the follow up comments to the communication in July(5 August) →Meeting with QC-OP4 (10 Sep) • NEDA submitted comments to EMB (18 August)
9th SG	4 Nov.	• Responses to NEDA and QC comments
	Nov.	• Endorsement by NEDA and QC for JCC

2. BAT/BEP Guidelines in the TCP (Backgrounds and understanding)

1. NSWMC Resolution669-2016:

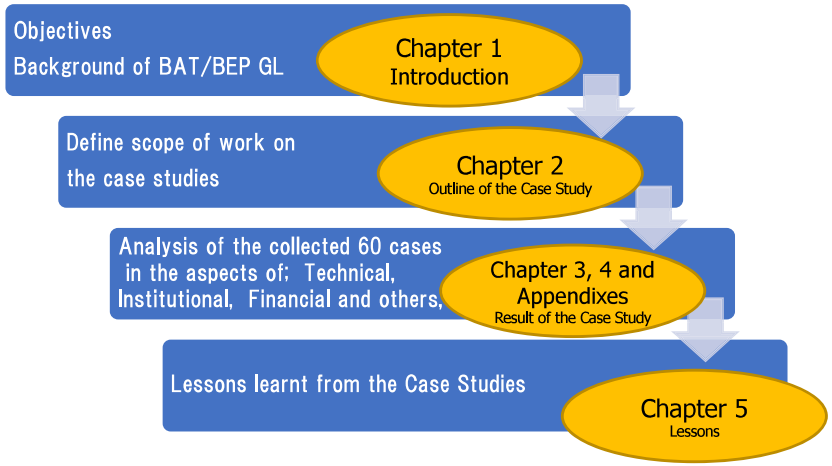
   The National Ecology Center (NEC) is in charge of finalizing and publishing the BAT/BEP guidelines

2. Understanding in the TCP:
   1. BAT/BEP Guidelines to be drafted in the TCP with cooperation with DOST, while finalization of the guidelines and preparation of budget shall be arranged by the NEC
   2. "BAT/BEP Guidelines for WTE technologies" will not be "Obligation" but "Recommended Technologies" for WTE.

The document can be a guidance for the BAP/BEP Guideline

3. The Case Study Analysis

3.1 Structure of Document



3.1 Scope of Case Study

1. WTE Technology
   - WtE facilities utilizing combustion technology, as the Appropriately Controlled Combustion (WtE-ACC)
2. Countries and Region
   - East Asia (Japan, China, Taiwan and Korea)
     - a high percentage of cases processed by WtE-ACC and a large number of cases.
   - Southeast Asia/ South Asia
     - Same region where the Philippines are located
   - EU, North America (Other Developed Region)
     - Other Developed Region
3. Treatment Capacity
   - Minimum 100 tons/day, which may avoid low efficiency and unfeasibility of facilities

3.2. Results of Case Studies

The Collected WtE Cases

Region/ Country	Number of Cases
East Asia	32
China	1
Japan	30
Taiwan	1
Southeast/ South Asia	8
India	1
Singapore	4
Thailand	2
Vietnam	1
North America	3
USA	3

Region/ Country	Number of Cases
EU	17
Austria	2
Belgium	1
Denmark	2
Finland	2
France	1
Germany	1
Italy	1
Netherlands	1
Norway	1
Spain	1
Sweden	3
United Kingdom	1
Total	60

Example of Collected Case Study (Suginami Incineration Plant)

Name	Suginami Incineration Plant	Location	Suginami ward, Tokyo, Japan
Impl. Body	Clean Authority of TOKYO	Footprint	3.6 ha
Capacity	600t/d (300 x 2lines)	Heat Usage	Power 24.2MW
Target Waste	Combustible municipal solid waste	Waste Quality	8,854 kJ/kg

History

	Dev. Plan	Demolish	Bid	Const. St/Fin		Op. Start/Fin		Demolish
Original	-	-	-	-	-	-	-	-
Actual	-	-	-	2012	2017	2017	-	-

Capex	-	Fund Source	NG Subsidy + LG
Opex	1.01 B-JPY/yr (2019)	Fund Source	LG + TF + Energy
Fin. Scheme	Public Build (DB) and Own	Dev. Approach	Solicited

Coverage (SOW)

Collection	Transp.	Incineration	Power sale	Bottom ash	Fly ash
LG (ward)	LG (ward)	LG	LG	LG	LG

Process Type	Stoker type	EPC / Tech	Hitz (JPN)

Pollution Control

Exhaust Gas	Wastewater	Bottom ash	Fly ash	Other
Stricter Standard (Scrubber + SCR + Bag Filter)	Discharge to Sewage	Eco-cement or SLF	SLF after chemical treatment	

Example of Collected Case Study (Nong Khaem WTE plant)

Name	Nong Khaem WTE plant	Location	Nong Khaem, Thailand
Impl. Body	C&G Environmental Protection Holdings Limited (C&G)	Footprint	? ha
Capacity	500 t/day	Heat Usage	Power 9.8MW
Target Waste	Municipal solid waste	Waste Quality	? KJ/kg

History

	Plan	Bid	Const. St/Fin		Op. Start/Fin		Demolish
Original	-	-	-	-	-	-	-
Actual	-	-	-	2014	2014	2034	-

Capex	THB 900 million	Fund Source	Bangkok Metropolitan Authority (BMA)
Opex	1000 Bahts/ton	Fund Source	Tipping fee from BMA + energy sale ?
Fin. Scheme	BOT	Dev. approach	?

Coverage (SOW)

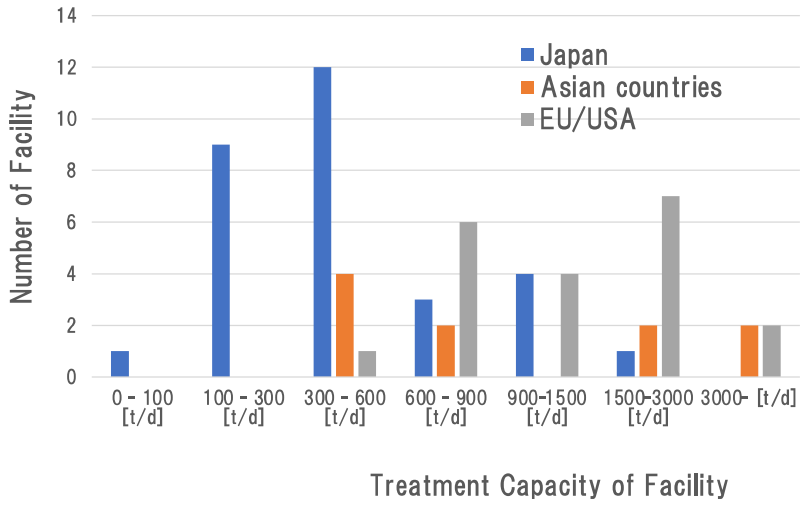
Collection	Transp.	Processing	Energy sale	Bottom ash	Fly ash
C&G	C&G	C&G	C&G ?	BMA ?	BMA ?

Process Type	Stoker type	EPC / Tech	New Sky /Hitz ? (Remarks if any)

Pollution Control

Exhaust Gas	Wastewater	Bottom ash	Fly ash	Other
?	?	?	?	?

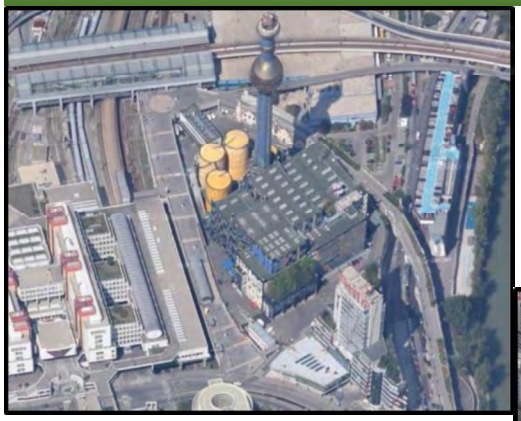
Treatment Capacity of the WtE-ACC Facilities



Type of Combustion Furnace

	Fluidized bed (FB)	Stoker	Gasification and Melting (GM)	FB, GM	Total
1. East Asia	3	25	3	1	32
2. Southeast/ South Asia	0	8	0	0	8
3. EU	3	13	0	0	17
4. North America	0	2	0	0	3
Total	6	48	3	1	58
Ratio (%)	10	83	5	2	100

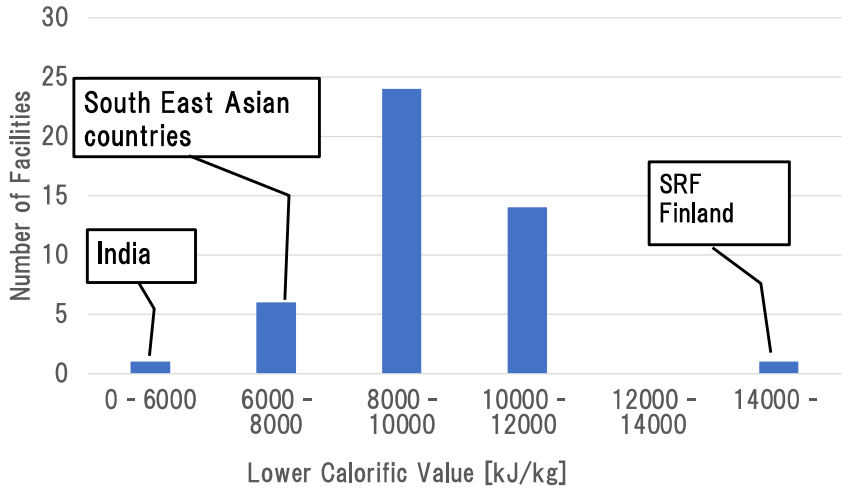
WtE Facilities located in the Center of the Urban Area



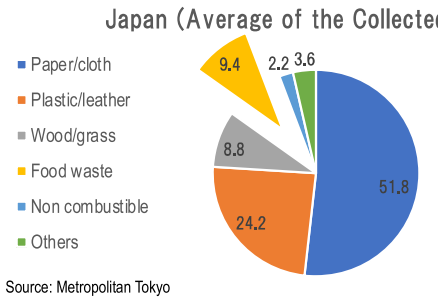
Wien-Spittelau, Vienna, Austria
Source: Wien Energie GmbH

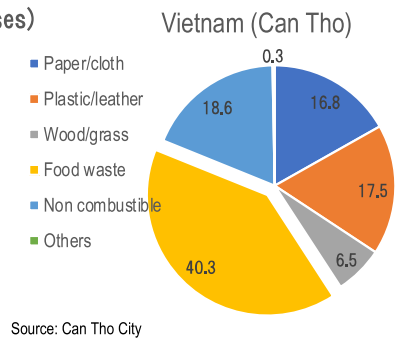
Shibuya Incineration Plant, Tokyo, Japan
Source: Clean Authority of Tokyo

Lower Calorific Value of the Waste



Physical Composition of Target Waste





Physical Composition of Waste for WTE-ACC in Japan (%)

Physical composition (dry base)	Paper/ cloth	Plastic/ Leather	Wood/ grass	Food waste	Non-combustible	Others
Maximum	63.5	32.0	19.3	19.6	5.9	13.6
Average	51.8	24.2	8.8	9.4	2.2	3.6
Minimum	42.6	17.4	2.4	5.3	0.7	0.0

Emission Standards of Exhaust Gas

Parameter	Japanese Law	Facility standard (Shinkoto)	Actual
NOx [ppm]	250	60	36 - 41
HCl [ppm]	430	15	<2
SO_2 [ppm]	Area basis	20	<1
Particulates [mg/Nm^3]	80	0.02	<0.001
Mercury [μg/Nm^3]	50	-	<5
DXNs [ng/Nm^3]	0.1	-	<0.00005

Parameter	EU Directive	Facility standard (Isseane, France)
NOx [ppm]	87.7	28.5
HCl [ppm]	5.5	2.2
SO_2 [ppm]	15.7	7.5
Particulates [mg/Nm3]	9	1.3
Mercury [ppm]	45	13.1
DXNs [ppm]	0.09	0.03

Environmental Monitoring

Examples of EU and Japan

Item	O&M/S in Japan (Section 17 above)	MOE Circular (Kansei 95), Japan	EU directive 2000/76 (EU Directive 2010-75)	WTE Technical Standards (under endorsement) in the Philippines
	Mandatory	Recommended	Mandatory	
Capacity of WtE	All	For >200t/d		
DXNs	1/year	-	2/year	1/year
SOx	2/year	6/year	Continuous	2/year
Dust	2/year	6/year	Continuous	2/year
HCl	2/year	6/year	Continuous	2/year
NOx	2/year	6/year	Continuous	2/year

Business Scheme of WtE-ACC Case Studies

Business Scheme	Number of cases	In Japan	Outside of Japan	Remark
Public Build (DB) and Operate	21	13	8	Japan, Singapore, Netherland, Italy, Denmark, Finland
DB+O (15yrs)	1	1	0	Japan
DB+O	2	0	2	France, Singapore
DBO (15yrs)	4	4	0	Japan
DBO (20yrs)	10	9	1	Japan, USA
BTO (20yrs)	2	2	0	Japan
BOT (20yrs)	3	0	3	Thailand, Taiwan, India
BOO (25yrs)	1	0	1	Singapore
BOO (22yrs)	1	0	1	Vietnam
-	15			No information
Total	60			

Development Approach of WtE-ACC Case Studies

Development Option	Cases	%
Solicited	51	85
Solicited (1993), Unsolicited (2007)	1	2
No information	8	13
Total	60	100%

3. Findings

3. Findings
1) Target waste

- The target waste of WtE is not decided uniformly. LGUs shall decide or check the target waste to be treated in their WtE facility their plan.
- The waste segregation commonly practiced before treatment by WtE facility.
- The segregation practice, methodology and technology in the preceding countries can be references to the LGUs in the Philippines

3. Findings,
2) Combustion Technologies and Treatment Capacity

- Stoker (moving grate) is the mostly adopted because of track record, variety of treatment capacity.
- Since, the operation period of WtE facility is long as 20 years or more, the technology shall be evaluated carefully.
- The LGUs shall evaluate type of furnace appropriate for their solid waste amount.

3. Findings,
3) Area

- The area for WtE can be minimized according to availability of land and the conditions of the surrounding area.
- WtE facilities have been constructed and operated in the populated and urbanized area.

3. Findings,
4) Energy Recovery

- The electricity generation efficiency has been improved as the treatment capacity of WtE facilities become bigger.
- To achieve very high efficiency of electricity generation, more cost could be required.
- Various methodologies which contribute to improve the efficiency of energy recovery is available

3. Findings,
5) Pollution Control

- Environmental standards of WtE facility is set as stricter than the National standards in the existing cases.
- Such stricter standards can be met by installing appropriate pollution control technology and eases making public consensus for its development

3. Findings,
6) Ash Handling

- Utilizations of bottom ash as cement aggregate, other construction use are practiced. Such utilization sometime requires additional cost and could be revenue source depending on the conditions.
- Fly ash containing heavy metals or other toxic materials, it is stabilized by cement solidification, chemical treatment, or dispose at hazardous waste landfill site.

3. Findings,
7) Business Scheme

- A solicited approach was adopted in almost all cases in the case study.
- This is the fact that the WtE projects took this approach could reach to the construction and operation.
- Proposals from the private sector are based on the proponent's interest, which may not be best for waste management in the LGUs.

THANK YOU FOR YOUR ATTENTION!