

Courtesy
Peter Brady

INTEGRATED WASTE MANAGEMENT FACILITY (IWMMF)



Industry Briefing

12th March 2018

 **BLACK & VEATCH**  **AECOM**

A JOINT VENTURE
DELIVERING THE IWMMF PROJECT

In Association With

 **RAMBOLL**

 **National
Environment
Agency**
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Welcome and Format of Today's Briefing

- Mr Joseph Boey (Project Director, NEA IWWMF Project)
- Mr Geoffrey Piggott (Project Director, Owner's Engineer, IWWMF Project)

Safety Moment

- In case of Emergency during this Event.
- IWMF Project focus on Safety and Expectations from all Stakeholders
- Building a Strong Safety Culture
- Responsibility for and Leadership in Safety
- Exceed “Business as Usual” Approach to Safety; let us all make a difference !!
- Safety Initiatives Associated with the Project
- Join us in the Goal to make IWMF an outstanding example of the implementation of a major project with a Strong Safety Culture and Safety Performance

Integrated Waste Management Facility (IWMMF) Design Concept & Technologies



Broad Objectives of IWMMF

- An integral part of NEA's long-term plan to meet Singapore's future solid waste disposal needs.
- As a state-of-the-art flagship facility, it will be developed to achieve greater environmental sustainability and provide Singapore with an affordable waste management system when completed.

Strategic Drivers & Objectives of IWWMF

Drivers

- Land constraints
- Resource constraints
- Energy constraints
- Carbon constraints / climate change
- Environmental constraints
- Strategic comms

Objectives to be met by facility design & operation

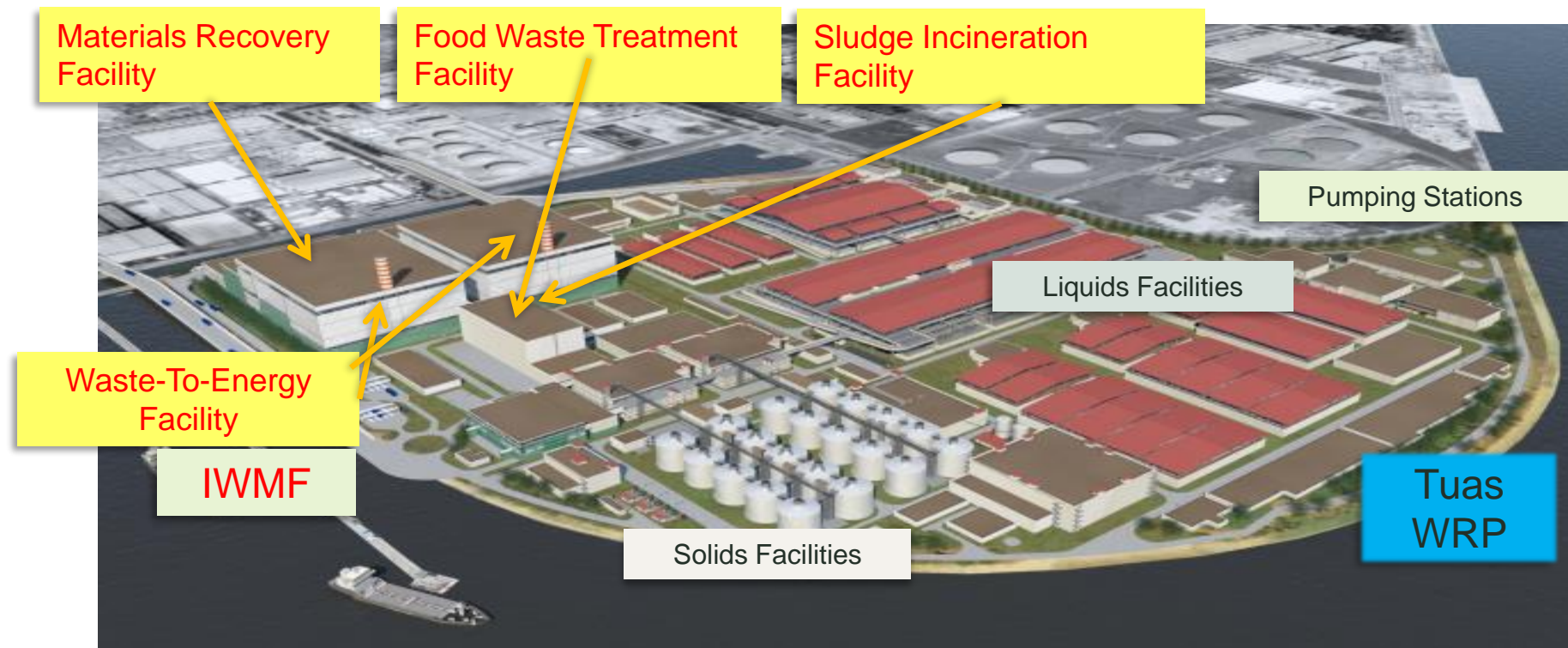
- Optimise land use for waste management & water reclamation
- Minimise residues sent to Landfill
- Maximise resource recovery
- Maximise energy production & recovery
- Maximise waste heat recovery
- Maximise carbon capture & minimise carbon emissions
- Minimise environmental impact
- Communicate zero waste and climate vision effectively

IWMF as a Solid Waste Treatment Facility

IWMF will provide several key solid waste treatment processes in an integrated facility to effectively handle various waste streams such as incinerable waste, household recyclables collected under the National Recycling Programme (NRP), source-segregated food waste and dewatered sludge from Tuas WRP.

Design objectives include:

- Maximisation of energy and resource recovery
- Minimisation of environmental impact
- Optimisation of land use
- Optimisation of synergies through co-location with TWRP



Key Facilities of the IWMF

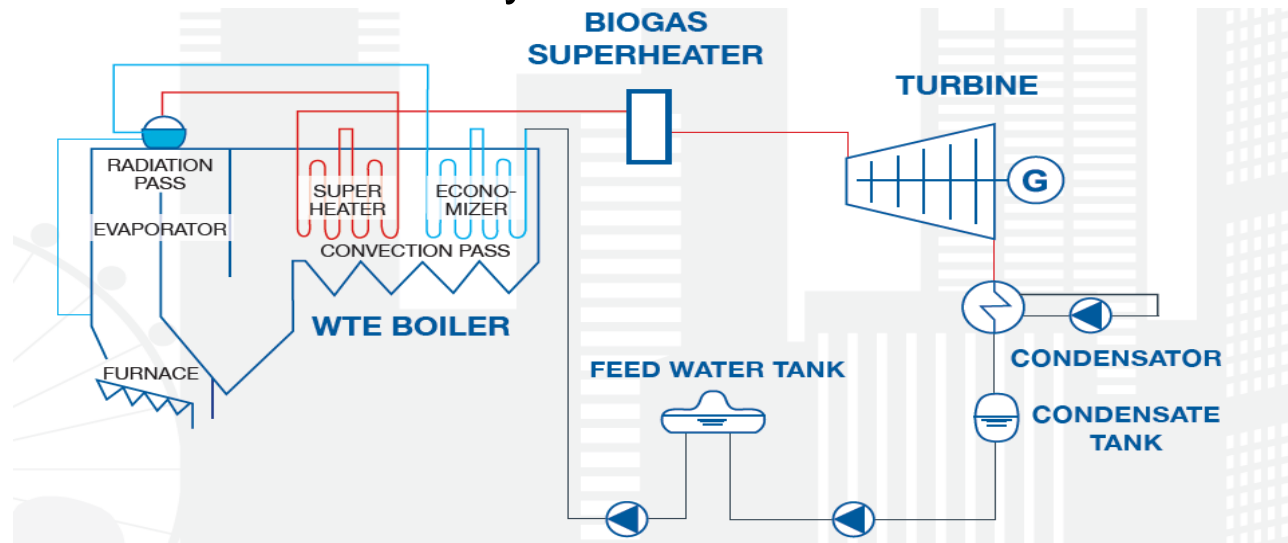


Waste-To-Energy Facility: Incinerable Waste

- Facility to treat Incinerable Waste with Advanced Moving Grate Technology
 - Goal: To ensure high volume reduction in waste and maximise energy and resource recovery
 - Key Criteria for Technology Selection
 - Commercially available
 - Offered by reputable manufacturers
 - Reliable: Reference plants with substantial track records
 - Volume reduction: Min 90%
- Reliable capacity = 5800 t/d (8 units)
- Key design features:
 - Innovative energy system → High power production
 - Wet flue gas treatment system → Clean air emissions
 - Advanced metal recovery → Facilitate metal reuse

Project Innovations – Improve Power Production

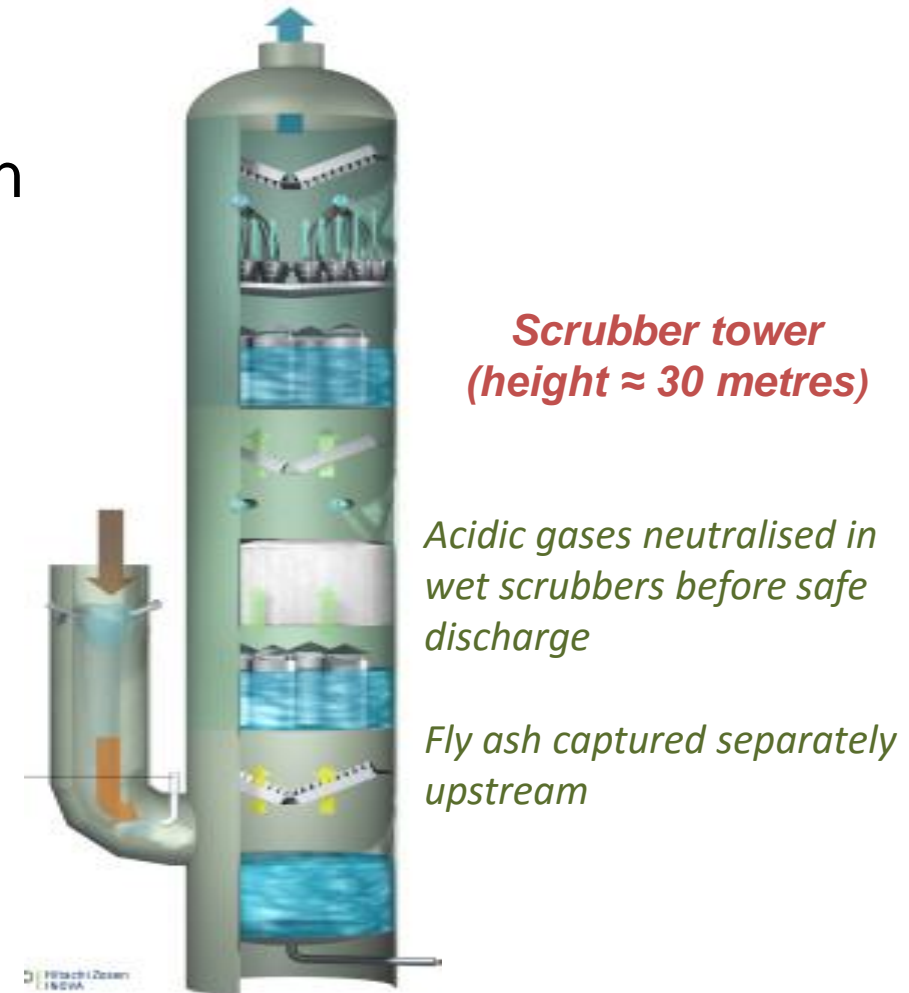
- IWMF will be able to achieve high overall plant thermal efficiency (~ 28%) through:
 - Optimised combustion process and boiler designs
 - Increased steam parameters 370°C/35 bar → 440°C/55 bar
 - Use of external biogas superheaters to boost steam parameters from 440 °C/55 bar → 480 °C/55 bar
 - Optimised Air Cooled Condenser System



- ✓ Annual power production of IWMF will be ~ 2 Million MWh
- ✓ Export to grid approx 200MW
- ✓ Can power more than 300,000 apartments (4-room apartments)

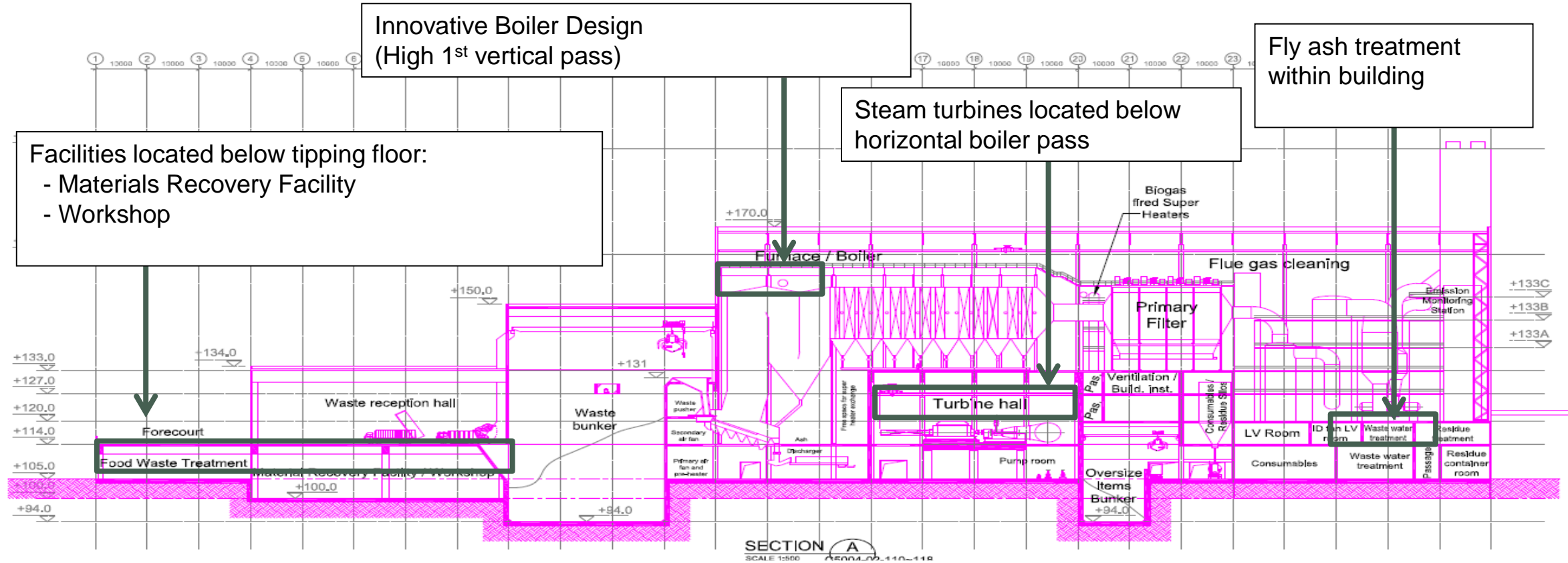
Project Innovations – Minimise Environmental Impact

- IWMF will be designed with a Wet FGT system to produce clean air emissions to meet Sg Air Emission Requirements and possibly EU Requirements
- This will allow IWMF to future-proof against further tightening of air emission requirements
- The Wet FGT will allow IWMF to minimise solid residue disposal as less chemical is required
- This will extend the lifespan of Semakau Landfill



Preliminary Design Layout

- Preliminary design layout has adopted innovative use of space to house all facilities while optimising land use.



✓ Achieve land use savings of about 2 ha

Materials Recovery Facility: Household Recyclables

- Materials Recovery Facility (MRF)
 - Goal: Improve sorting efficiency, product quality and reduce land-take
 - Technology based on advanced automatic systems to sort metals, paper, cardboard and plastics
- 2 units x 125 t/d (equipped with trommels, magnetic separators, eddy current, near-infrared (NIR) etc.)



Food Waste Treatment Facility

- Facility to treat source-segregated food waste to high quality bio-pulp for co-digestion with sludge at Tuas WRP
 - Goal: To recover more energy from food waste via co-digestion with used water sludge
 - Well-proven technology based on screw press or other proven technology → High quality bio-pulp with rejects sent to WtE bunker
 - 2 units x 200 t/d based on screw-press or other proven technology



Sludge Incineration Facility

- Sludge Incineration Facility

- Goal: Treatment of Tuas WRP sludge and energy recovery
- Fluidised bed technology is selected due to good track record and ability to 'open-up' the structure of the wet cake
- 2 units x 400 t/d for treatment of dewatered sludge



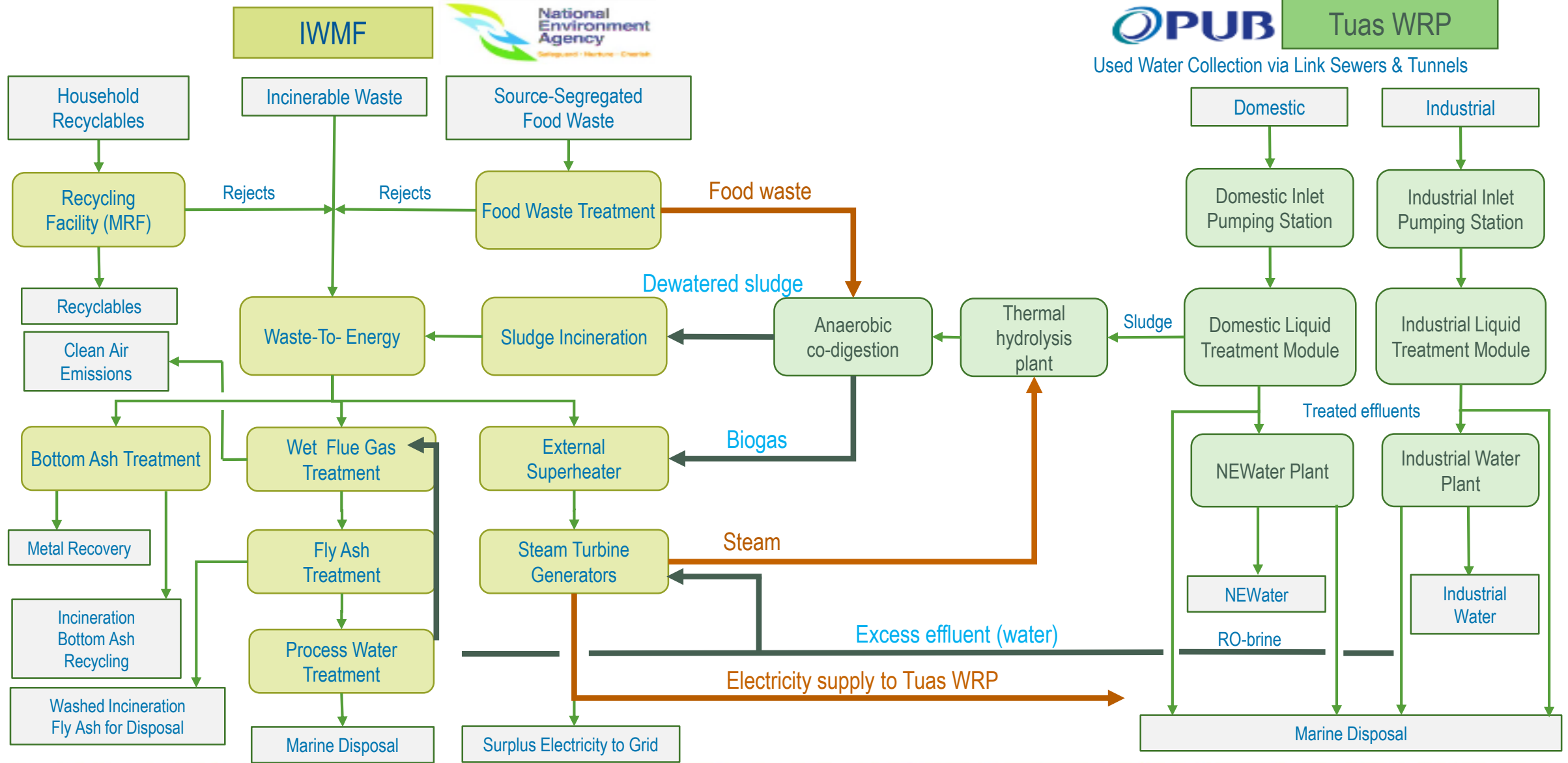
IWMF – Technical Overview (subject to change)

Waste Streams	Treatment Capacity	Technology
Incinerable Waste	<ul style="list-style-type: none"> • 5,800 t/d (reliable) <ul style="list-style-type: none"> • Phase 1 – 2,900 t/d • Phase 2A – 1,450 t/d • Phase 2B – 1,450 t/d • Design NCV : 10 MJ/kg (under review) • NCV envelope: 7-13 MJ/kg 	<ul style="list-style-type: none"> • 8 units at 725 t/d each • Advanced Moving Grate at medium pressure 55 barG and 440/480 °C • Air Cooled Condensers • Wet Flue Gas Treatment (FGT)
Household Recyclables (NRP)	<ul style="list-style-type: none"> • 250 t/d 	<ul style="list-style-type: none"> • 2 units at 125 t/d each • Magnetic Separators • Trommels • Eddy Current Separators • Ballistic Separators • Near-Infrared Sorting
Food Waste	<ul style="list-style-type: none"> • 400 t/d 	<ul style="list-style-type: none"> • 2 units at 200 t/d each • Shredders/Crushers • Mixers • Screw-press or other proven technology
Dewatered Sludge from Tuas WRP	<ul style="list-style-type: none"> • 800 t/d 	<ul style="list-style-type: none"> • 2 units at 400 t/d each • Sludge Dryers • Fluidised Bed Incinerators • Bag Filters • Wet FGT

Co-Location Synergies

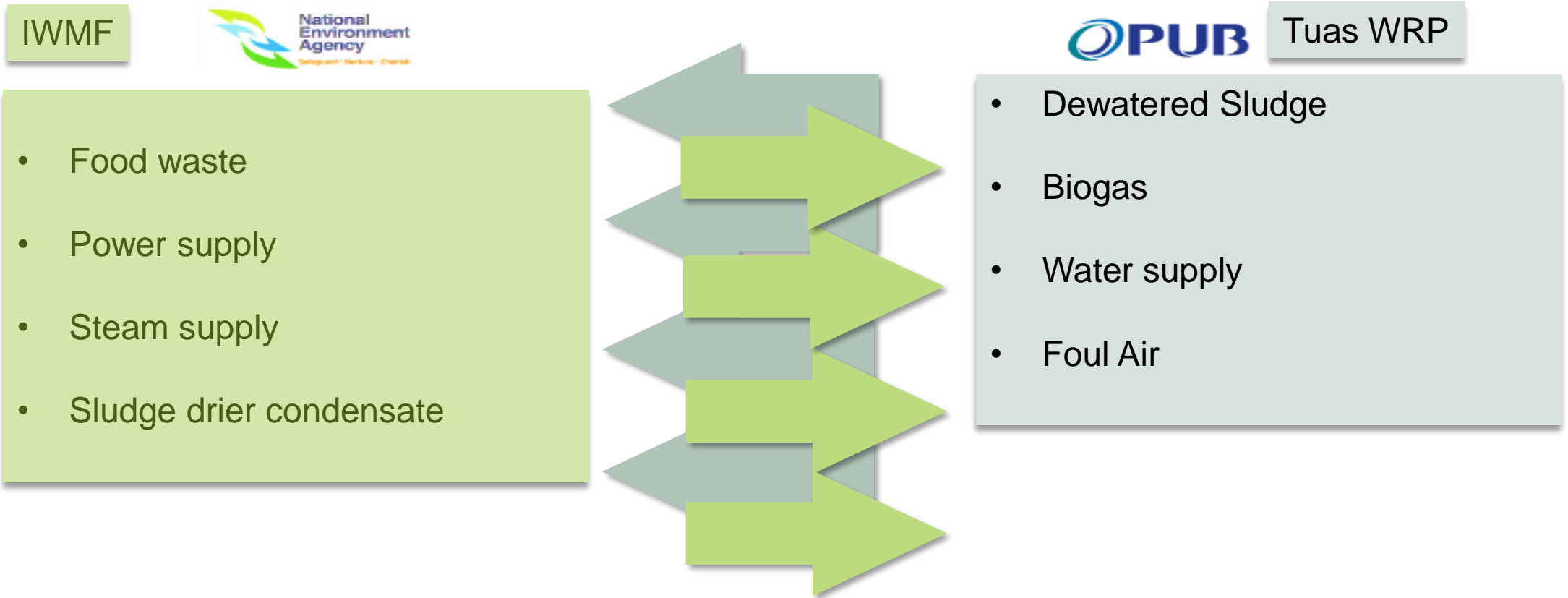


Co-location Synergies between Tuas WRP and IWMF



Co-location Synergies between Tuas WRP and IWMF

• SYNERGIES BETWEEN TUAS WRP & IWMF



Physical Synergies include the Administration Building and Site-wide infrastructure

Contract Packaging & Implementation Timeline



Contract Packaging (subject to change)

- **230KV Substation Contract:**
 - Build only contract with Design by OE
 - Open GEBIZ Tender to ME5/ME11 L6/CW01/02 A1/A2 Contractors with large Substation construction and commissioning experience.
 - Tender in Q4 2018
 - Price/Quality/Productivity Tender Assessment
 - Award in 1H 2019
 - Re-measurable BQ Contract to Singapore PSSCOC Conditions of Contract for Build Contracts
 - Contract Duration including commissioning, hand-over and energisation: 30 months

Contract Packaging (subject to change)

- **Phase 1 EPC Contract 1: IWMF (2900 T/d Waste to Energy + 250T/d MRF):**
 - Preliminary Design by OE. Detailed Design, Construction, Commissioning and Plant Proving by EPC Contractor
 - Prequalification Announcement for a single PQ exercise for Phase 1 EPC Contracts 1 and 2 on GEBIZ: Q2 2018 with 3 months PQ preparation and submission period
 - PQ Assessment and Announcement of PQ'd EPC Contractors/Consortia in Q4 2018. PQ assessment will take into account the following factors amongst others:
 - Track record and experience in the delivery of major advanced moving grate technology Waste to Energy Plants in the last 10 to 15 years;
 - The successful operational performance of such plants;

Contract Packaging (subject to change)

- **Phase 1 EPC Contract 1: IWMF (2900 T/d Waste to Energy + 250T/d MRF):**
 - Experience and track record of key technology providers including but not limited to grates/boilers, flue gas cleaning, turbines and turbine cooling; sludge incineration plant, food waste treatment facilities and MRF's of a similar scale and complexity to those proposed
 - OHS&E track record and systems in place;
 - Productivity track record and initiatives proposed on the Project;
 - Available resources that can be applied to the project and experience of key team members proposed; and
 - Outline delivery methodology proposed in the PQ submission.
- EPC Contractors to be registered in the relevant workhead and financial category (e.g. ME11L6 /CW01/02 A1) (or be able to achieve such prior to award of Contract). Consortia if proposed, are to be Unincorporated with Joint and Several Liability.

Contract Packaging (subject to change)

- **Phase 1 EPC Contract 1: IWMF (2900 t/d Waste to Energy + 250T/d MRF) continued**
- * EPC Bid Period: 4 to 5 months
- * Tender assessment on Price/Quality/Productivity
- * Anticipated award in 2H 2019
- * Lump Sum EPC Schedule of Prices Contract with progress based payment to PSSCOC
EPC Conditions of Contract
- * Overall Contract Duration: 58 months:
 - * Interim Milestone 1: 2 of 4 Lines Commissioning on waste: 40 months
 - * Interim Milestone 2: Remaining 2 of 4 Lines Commissioning on waste: 46 months
 - * Final Completion including Full Commissioning and Plant Proving/Training/Handover: 58 months
 - * 2 years DLP

Contract Packaging (subject to change)

- **Phase 1 EPC Contract 2: Sludge Incineration Plant + Food Waste Treatment Facilities**
 - Single EPC Contract same as EPC Contract 1 using the results of the single PQ process previously described.
 - Issue Tender Documents to PQ'd EPC Contractors/Consortia: Q4 2018
 - EPC Bid Period: 4 to 5 months
 - Tender assessment on Price/Quality/Productivity
 - Anticipated Award in 2H 2019/1H 2020
 - Lump Sum EPC Schedule of Prices Contract with progress based payment to PSSCOC EPC Conditions of Contract
 - Contract Duration: 52 to 58 months including Full Commissioning, Plant Proving/Training/Handover
 - 2 years DLP

Contract Packaging (subject to change)

- **Phase 2 EPC Contract 1: IWMF (additional 2900 T/d Waste to Energy)**
 - NEA decision to proceed with Phase 2A (2 lines) and/or 2B (2 lines) will be made between 2020 and 2023.

Implementation Timeline of IWMF (subject to change)

Facilities	Phase	Development Period*		Contract
		Commencement Date Of Contract (Indicative)	Completion Date exclude DLP (Indicative)	
<ul style="list-style-type: none"> Electrical Substation, 230kV 	1	1H 2019	Q1 2022	Build Contract
PHASE 1 <ul style="list-style-type: none"> WTE Facility (Four lines commissioning) MRF 	1	2H 2019	2022/2023 interim commissioning of 2 and 4 lines respectively	EPC Contract 1 (Phase 1)
<ul style="list-style-type: none"> SIF FWTF 	1	2H2019/1H 2020	1H 2024	EPC Contract 2 (Phase 1)
PHASE 2 <ul style="list-style-type: none"> WTE Facility (Two lines) 	2A	2021-2023	2024-2027	EPC Contract 3 (Phase 2)
<ul style="list-style-type: none"> WTE Facility (Two lines) 	2B	2023-2027	2027-2030	

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