



**Drakenstein Municipality
Meeting with
Wellington Agricultural Component
7 September 2015**



Contents



- Background
- Waste-to-Energy Scenario
- Legal Process to Change
- Milestones for Waste to Energy
- Comparing Emissions with Standards
- Way Forward from Here
- Questions

Background



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Background (...1)



- Current Scenario
 - Drakenstein produces more than 500 tons of waste currently per day. (This includes building material and recyclables)
 - Cost approximately R170 per ton
 - Partial recycling being done



Background (...2)



- Future of Current Scenario
 - It is expected that the current landfill site would be full by 2022 if the current volume of waste is produced
 - Once the maximum volume has been reached, the landfill site must be rehabilitated and capped
 - No known Suitable new dumping site available in the whole of Drakenstein jurisdiction or within the Cape Winelands District west of the Drakenstein Mountains
 - All waste will have to be transported to another site. Currently only Cape Town would be able to provide this service
 - Cost to dump at Cape Town site approximately R600 per ton (R420 gate fee plus R180 transport)
 - Cost increase of R430 per ton or 353% just on transport and landfilling cost



Background (...3)



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- Mitigation of Future Impact
 - Various methods have been looked at to reduce landfill waste.
 - Best alternative is to reduce volume by extracting recyclables and composting were possible. Volume reduction 50%
 - Utilising a Waste-to-Energy process a further 85% can be reduced.
 - It is expected that the current 500ton of waste can be reduced to 200ton by recycling.
 - In order to utilise a Waste-to-Energy process a plant of 500ton per day must be operated to ensure best economic viability
 - Have to import 300ton of waste to become economically viable and be able to convert 500ton of waste to Ash and Energy.
 - This 500ton is then reduced to 50tons of ash per day
 - The ash will be landfilled and the life of the landfill site can be extended to 2037, where after the ash must be transported, but at only 25% of the cost if all Drakenstein waste had to be transported



Background (...4)



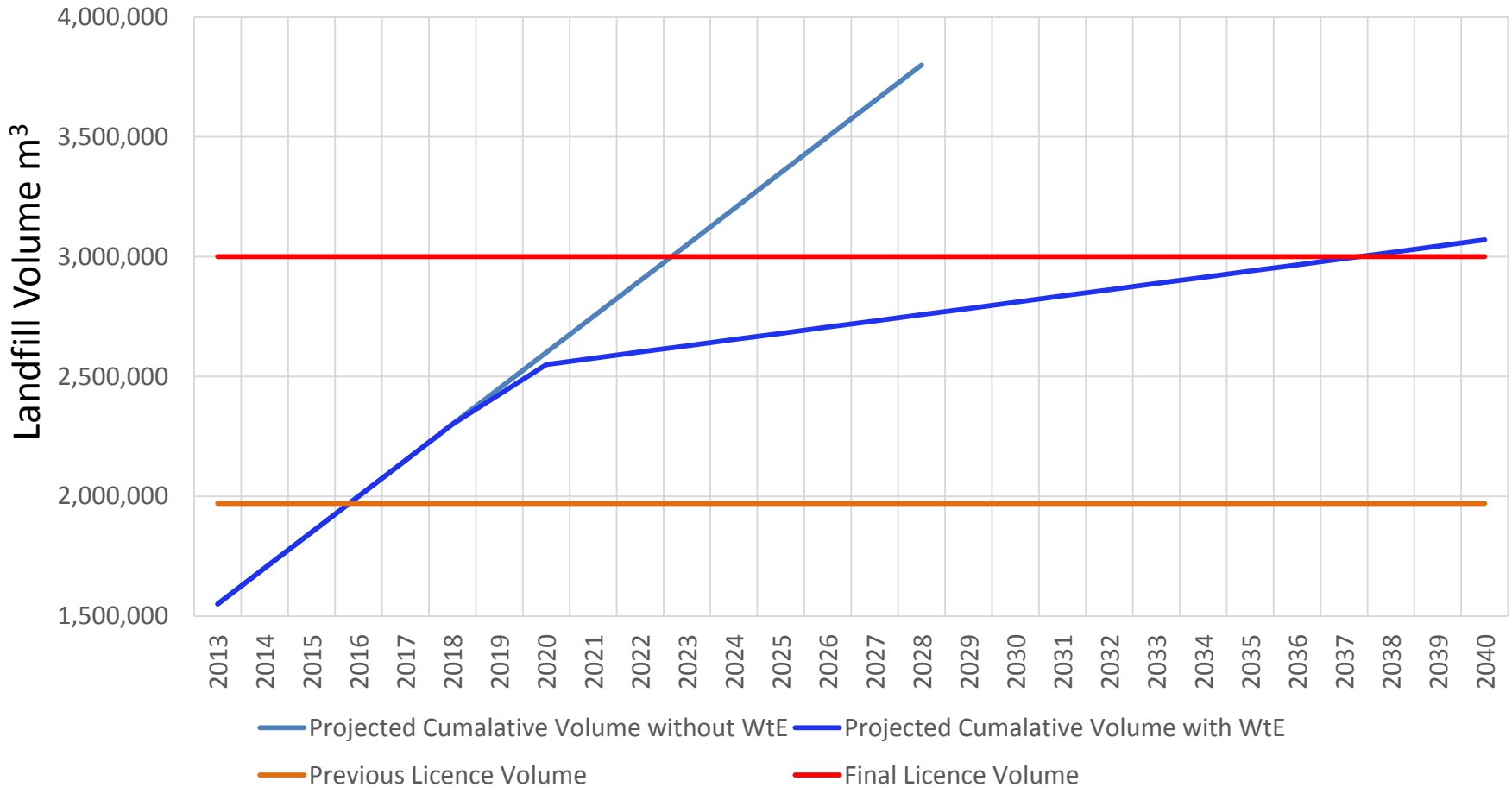
- Additional By-products
 - 10MW electrical output energy produced
 - Paving bricks can be manufactured from ash with a further addition to the WtE plant
 - Increased compost
 - Increased recycling



Utilisation of Landfill Site



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Cost Saving

- The current cost to treat waste is estimated at R170/ton
- The current cost to transfer waste to Cape Town is estimated at R600/ton
- This represents a saving of R430/ton.
- The total waste treatment savings until 2037 is therefore R335 million (in 2015 terms)
- An electricity energy purchase saving of R3.2 billion (in 2015 terms) can realized.
- Total saving of about R3.53billion can therefore be realised over the first 15 years of operation.



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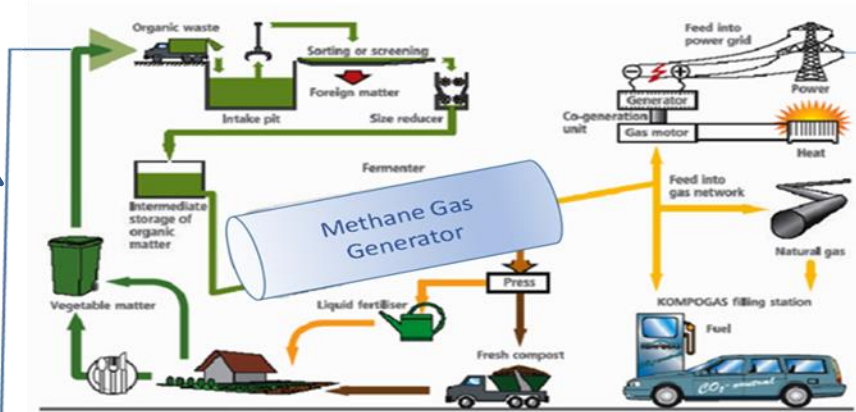
WASTE-TO-ENERGY SCENARIO



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Processes to be Used

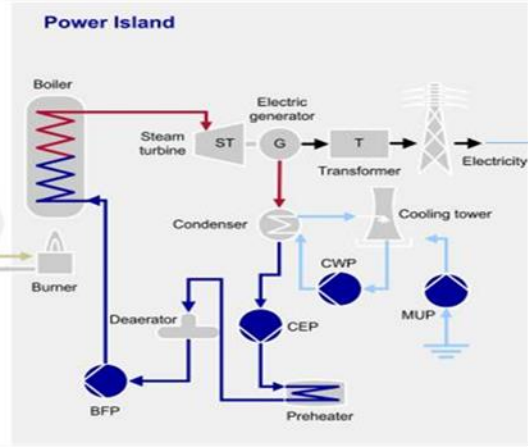
Anaerobic
Digester
Process



Typical Schematic Diagram of an Anaerobic Digester, which generates Methane Gas from Wet Waste. (Diagram copied from a Kompgas diagram from Sterner Consulting)

10MW Generated
into the
Drakenstein
Municipal
Electricity
Network

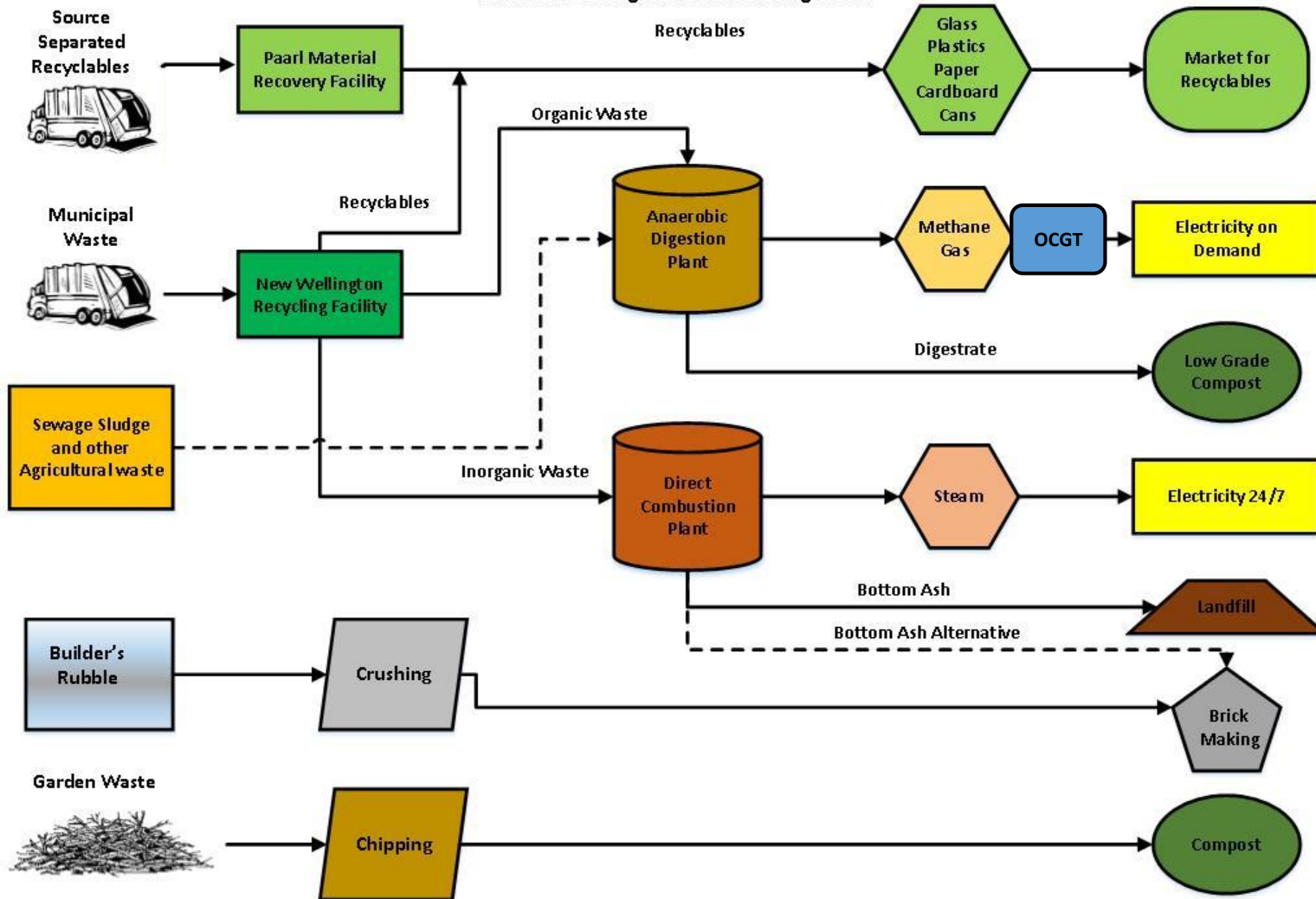
Waste
Delivered
to Plant



Typical Schematic Diagram of Solid Dry Waste Combustion Generator (Copied from SULZER Ltd)

Direct
Combustion
Process

Drakenstein Integrated Waste Management





Expected Cost of a WtE Plant and Impact on Drakenstein Municipality



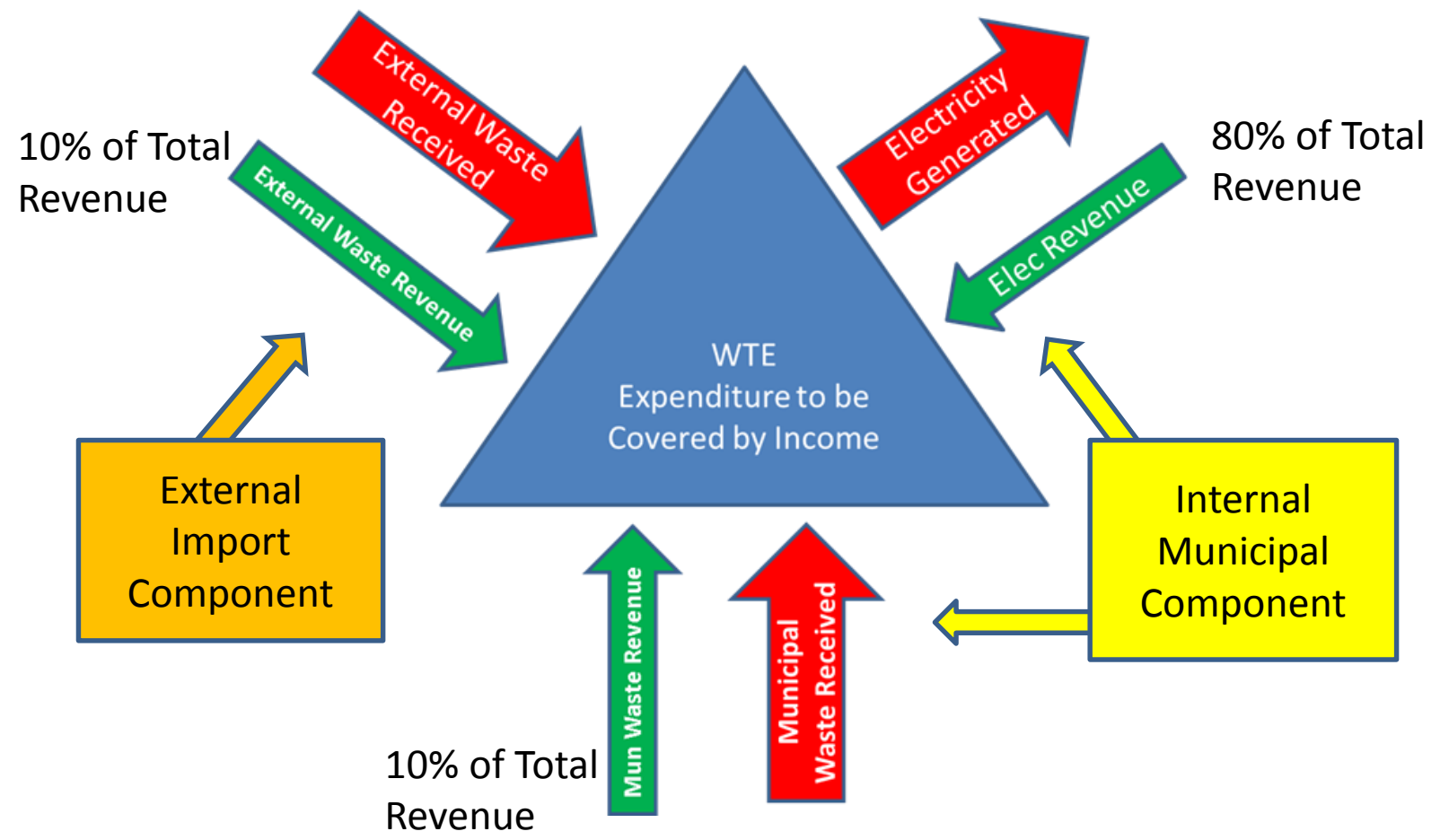
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- Plant of a 500ton/day capacity is expected to cost about R500million
- Current backlog of refurbishment of all Infrastructure Services assets is R5billion
- Gearing ratio to which municipality must adhere to is 0.5, which translates to about R300 million of capital per annum
- The Municipal can therefore not accept the additional financial risk of a fully fledged WtE plant
- An alternative to reduce this risk is to enter into a Public Private Partnership (PPP) entity
- The Municipality enters into a contract with a Service Provider that will Build, Own, Operate and Transfer (BOOT Scenario) the entity.
- There are very strict legislation controlling PPPs
- The following would apply should a PPP process be used



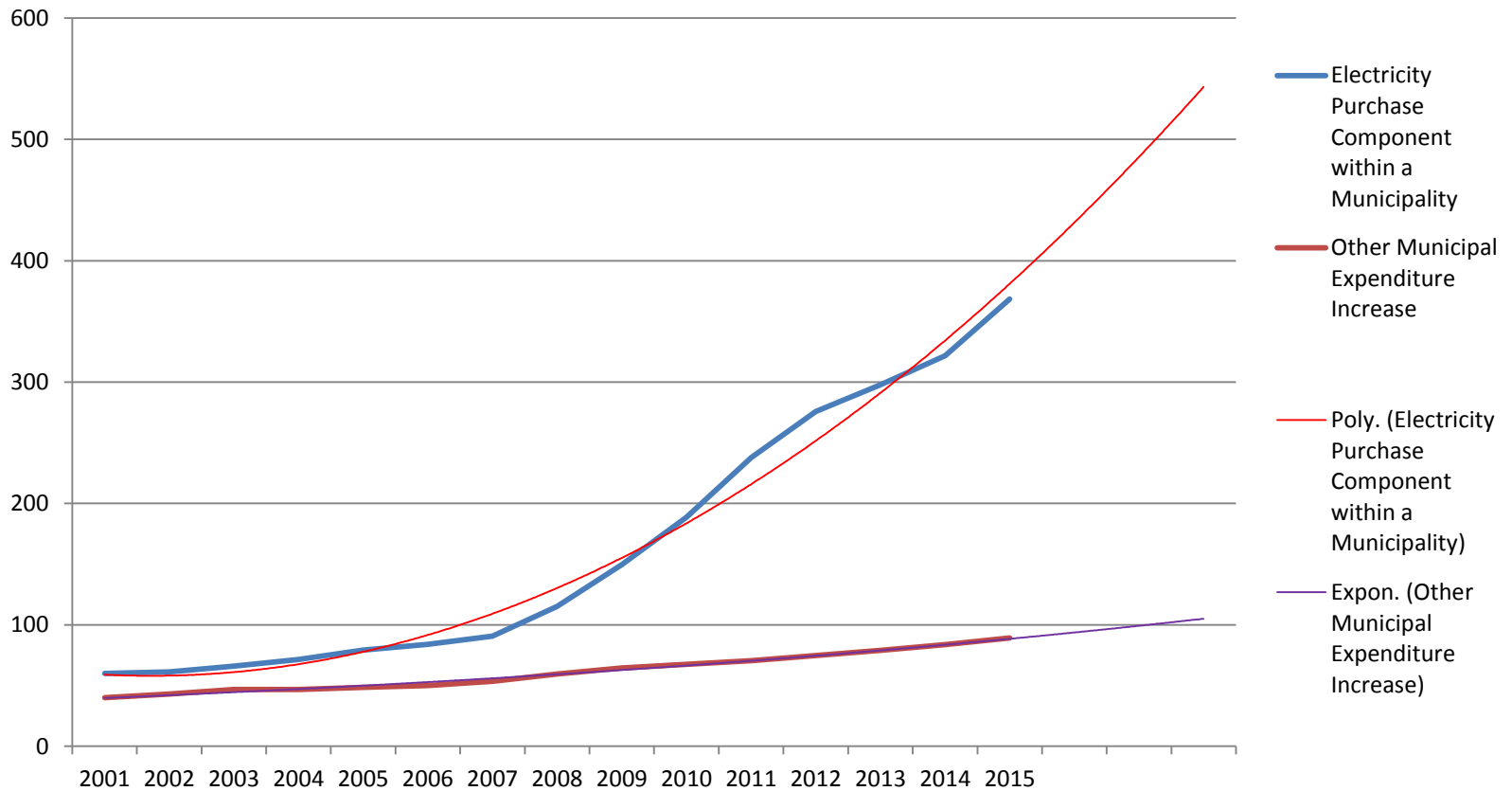
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Income vs Expenditure





Growth of Eskom Electricity Costs





Electricity Sales Analysis

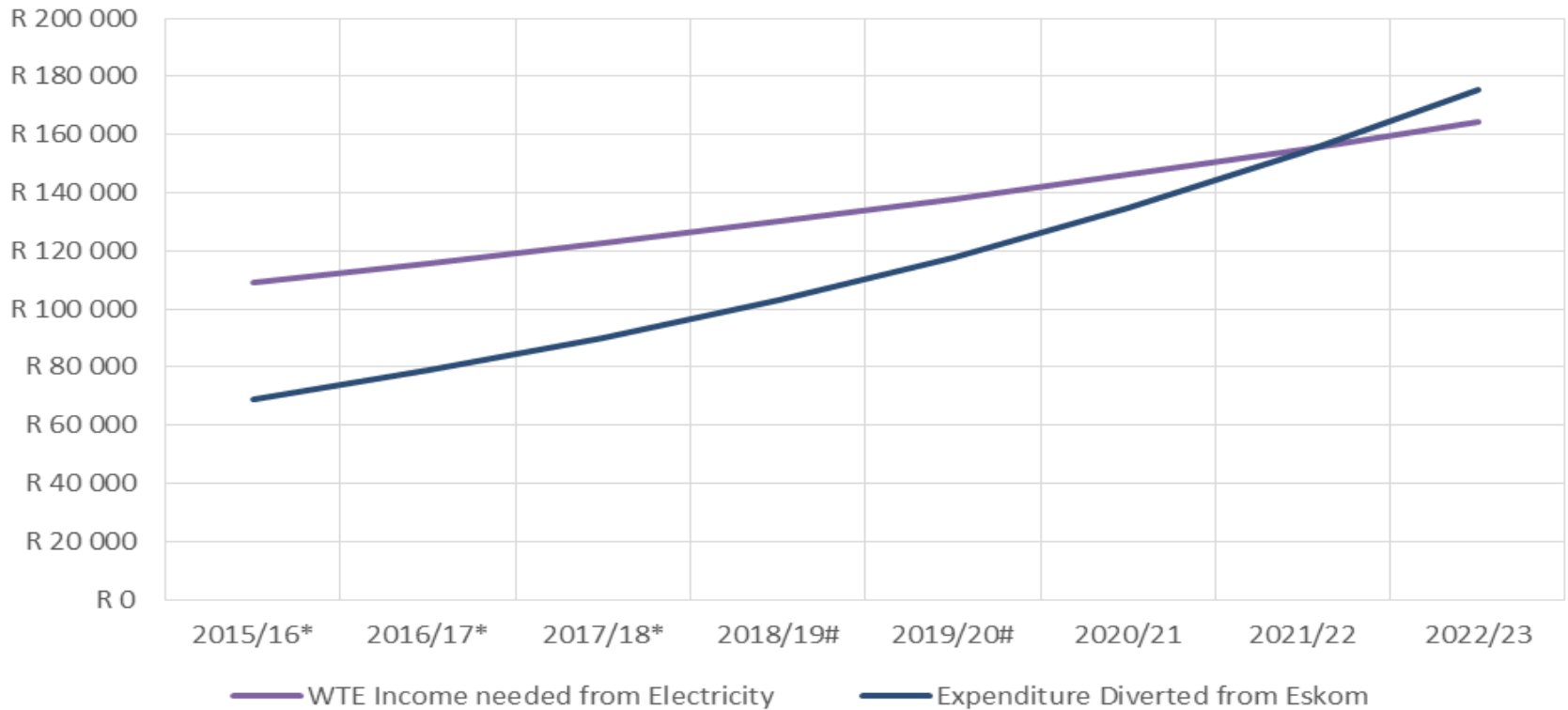


Table 5.1: High Cost increase on year one and thereafter equal Yearly Increases for Six Years				2015/16*	2016/17*	2017/18*	2018/19#	2019/20#	2020/21	2021/22	2022/23
	Description	Tariff	Quantity	Cost per Annum	Cost per Annum	Cost per Annum	Cost per Annum	Cost per Annum	Cost per Annum	Cost per Annum	Cost per Annum
		(As for 2015)		(R '000)	(R '000)	(R '000)	(R '000)	(R '000)	(R '000)	(R '000)	(R '000)
A	WTE Income needed from Drakenstein from Gate Fees (R/ton)	R 185	200	R 13 505	R 14 315	R 15 174	R 16 085	R 17 050	R 18 073	R 19 157	R 20 307
B	WTE Income needed from Electricity	R 1.25	87 358 492	R 109 198	R 115 750	R 122 695	R 130 057	R 137 860	R 146 132	R 154 900	R 164 194
C	Total Income Needed from Drakenstein Mun. (C=A+B)			R 122 703	R 130 065	R 137 869	R 146 141	R 154 910	R 164 204	R 174 057	R 184 500
D	Escalation figures used										
	Eskom Annual Electricity Increase			1.1424	1.1424	1.1424	1.1424	1.1424	1.1424	1.1424	1.1424
	Municipal Annual Electricity Increase			1.1269	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269
	Inflation (CPI)			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
	Break Even Determination										
E	Expenditure Diverted from Eskom			R 69 137	R 78 982	R 90 229	R 103 078	R 117 756	R 134 524	R 153 681	R 175 565
F	Shortfall (F=B-E)			R 40 061	R 36 768	R 32 466	R 26 979	R 20 104	R 11 607	R 1 219	-R 11 371
G	Current Drakenstein Electricity Income			R 920 859	R 1 037 716	R 1 169 402	R 1 317 800	R 1 485 028	R 1 673 478	R 1 885 843	R 2 125 156
H	% of Shortfall (H=(F x 100)/G)			4.35%	3.54%	2.78%	2.05%	1.35%	0.69%	0.06%	-0.54%
I	Impact of transporting waste to City of Cape Town. Cost of delivery would be R430/ton as opposed to the R130/ton. Cost increase is R300/ton	R 300	200					R 26 083	R 27 648	R 29 307	R 31 066
J	Resultant Additional Cost							-R 5 979	-R 16 041	-R 28 088	-R 42 437

*= Figure indicative only. Plant still under construction. # =Plant partially constructed



Graph 5.1b: Income (R'000) Required by WTE for Electricity vs Saving (R'000) Realised by Diverting supply from Eskom





Dangers of Processes as Described by British Medical Bulletin (...1)



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Option	Advantages	Disadvantages	WtE
Sewage treatment	<ul style="list-style-type: none"> • Safe disposal of human waste • Protects sources of potable water supply 	<ul style="list-style-type: none"> • Discharges may contain organic compounds, endocrine disrupting compounds, heavy metals, pathogenic microorganisms • Odour nuisance 	<ul style="list-style-type: none"> • Sludge will be treated in WtE and some pollutants will be reduced • Some odour removed
Landfill	<ul style="list-style-type: none"> • Cheap disposal method • Waste used to back fill quarries before reclamation • Landfill gas contributes to renewable energy supply 	<ul style="list-style-type: none"> • Water pollution from leachate and run off • Air pollution from anaerobic decomposition of organic matter to produce methane, carbon dioxide, nitrogen, sulphur and volatile organic compounds • Emission of known or suspected carcinogens or teratogens (<i>e.g.</i> arsenic, nickel, chromium, benzene, vinyl chloride, dioxins, polycyclic aromatic hydrocarbons) • Animal vectors (seagulls, flies, rats) for some diseases • Odour, dust, road traffic problems 	<ul style="list-style-type: none"> • Totally removed • Large % removed with filtering process • Large % removed with filtering process • Totally removed • Odour and Dust reduced dramatically. Traffic will remain



Dangers of Processes as Described by British Medical Bulletin (...2)



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Option	Advantages	Disadvantages	WtE Process
Recycling	<ul style="list-style-type: none"> • Conservation of resources • Supply of raw materials to industry • Reduction of waste disposed to landfill and incineration 	<ul style="list-style-type: none"> • Diverse range of processes • Emissions from recycling process • May be more energy used for processes than original manufacture • Currently low demand for products • Requires co-operation from individuals 	<p>Municipality and WtE will ensure that recycling will be beneficial to the public.</p> <p>Reduction of landfill waste is a premium</p>
Composting	<ul style="list-style-type: none"> • Reduction of waste to dispose to landfill and incineration • Recovery of useful organic matter for use as soil amendment • Employment opportunities 	<ul style="list-style-type: none"> • Odours, noise, vermin nuisance • Bio-aerosols—organic dust containing bacteria or fungal spores • Emits volatile organic compounds • Potential pathway from use on land for contaminants to enter food chain 	<p>All will be Controlled and minimised.</p> <p>Reduction of landfill waste is a premium.</p>



Dangers of Processes as Described by British Medical Bulletin (...3)



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Option	Advantages	Disadvantages	WtE Mitigation
Incineration	<ul style="list-style-type: none">• Reduces weight and volume of waste, about 30% (we estimate 10%) is left as ash which can be used for materials recovery• Reduces potential infectivity of clinical waste• Produces energy for electricity generation	<ul style="list-style-type: none">• Produces hazardous solid waste• Discharges contaminated waste water• Emits toxic pollutants, heavy metals, and combustion products	<ul style="list-style-type: none">• Ash nuggets produced will be lower in hazardous risk than current landfill process• Water will be treated and quality of discharge will be the same as Waste Water Treatment Standards of discharge• Ash nuggets produced will be lower in hazardous risk than current landfill process. A further process is planned to remove heavy metals from ash and to manufacture, or outsource manufacturing, of paving bricks

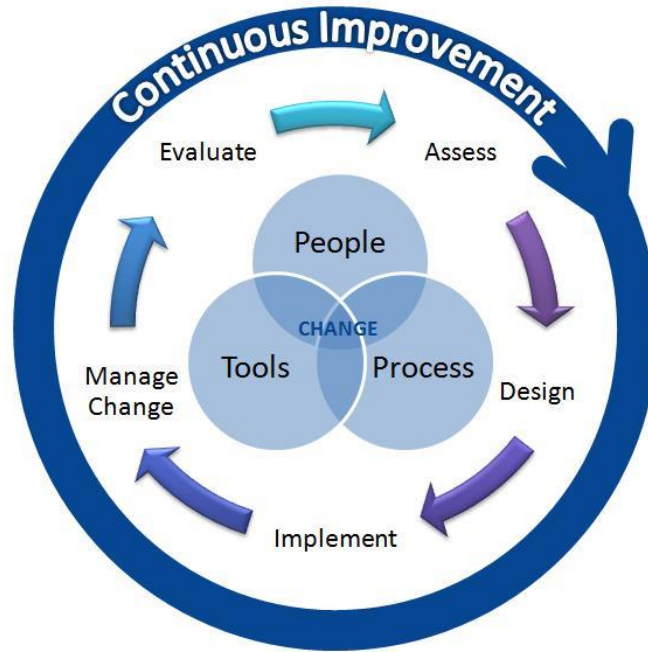


Dangers Mitigated by WtE



- No leachate
- No infected biological matter
- Many pollutants reduced
- Methane gas burnt/converted to CO_2 and H_2O
- Methane is 20 times more dangerous to the atmosphere than CO_2 . What is produced is therefore better than what a normal landfill produces
- Reduction of E.coli as some of the WWTW sludge will be treated in the WtE plant
- In general WtE will drastically reduce current dangers of Landfill site and some of the Waste Water Treatment process

Change Management Model



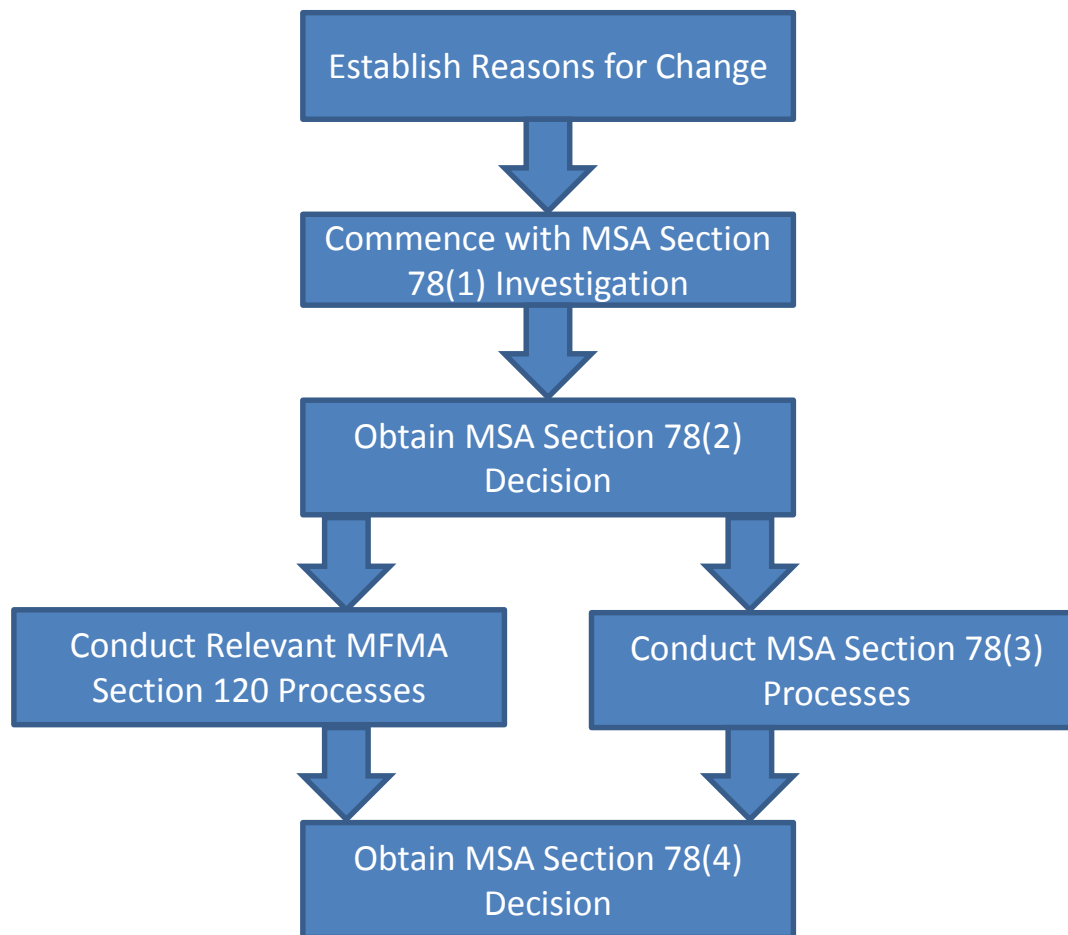
LEGAL PROCESS TO CHANGE

Legislation

- Municipal Systems Act (MSA), requires the municipality to investigate changes of Service Delivery, Section 77.
- MSA requires that Section 78 be used should a process need to be changed and Section 79 (internal) & 80(external) determine the vehicles to be used to deliver a service
- Municipal Finance Management Act (MFMA) also provides a Public Private Partnership (PPP) as an external alternative to be used for service delivery. Section 120 of the MFMA deals with this entity.
- The National Environmental Management Act (NEMA) controls the impact on the environment for any process that would have the potential to harm the environment.



Twin Process

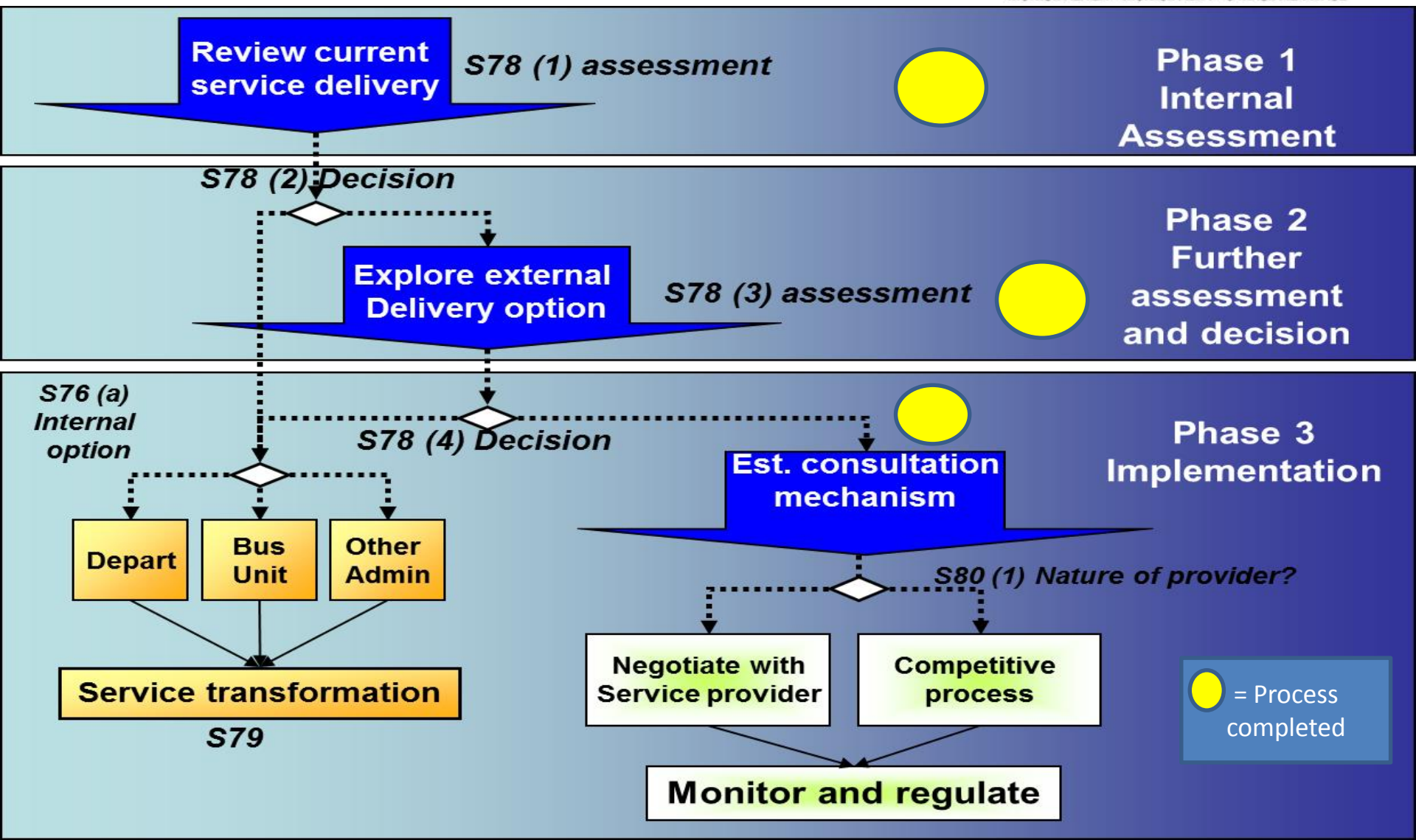




Municipal Systems Act – Section 78 Process



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MUNICIPAL PPP PROJECT CYCLE

INCEPTION

- Review and decide on mechanism to provide a municipal service
- Assess service provision through an internal mechanism
- Decide to explore external mechanism
- Appoint a Project Officer

FEASIBILITY STUDY

- Notify National Treasury and relevant provincial treasury
- [Treasury may request appointment of Transaction Advisor]
- Notify local community
- Assess the different options
- Conduct a feasibility study
- Set meeting date where Council to take "in principle" decision
- 60 days prior to meeting, make public particulars of feasibility study and invite comment
- Solicit views and recommendations of National Treasury, DPLG, sectoral department
- Decide "in principle"

PROCUREMENT

- Prepare fair, equitable, transparent, competitive procurement per Chapter 11 of the MFMA
- Solicit views of National Treasury and relevant provincial treasury on bid documents, including draft PPP agreement, 30 days before bids are issued
- Issue requests for proposals with draft PPP agreement
- Receive bids
- Compare bids with feasibility study and each other
- 30 days before award, solicit views of National Treasury and the relevant provincial treasury on the bid evaluation and preferred bidder
- Negotiate with the preferred bidder
- Finalise PPP agreement
- 60 days before signing, make draft PPP agreement public, and invite public comment
- Before signing, solicit National Treasury's views and recommendations on proposed terms and conditions, contract management plan and preferred bidders competency and capacity
- Before signing, solicit views and recommendations of relevant provincial treasury, DPLG and any prescribed sectoral department
- Municipal Council passes resolution authorising execution of PPP Agreement
- Accounting officer of Municipality signs the PPP agreement

PPP AGREEMENT MANAGEMENT

- Accounting officer responsible for PPP agreement management

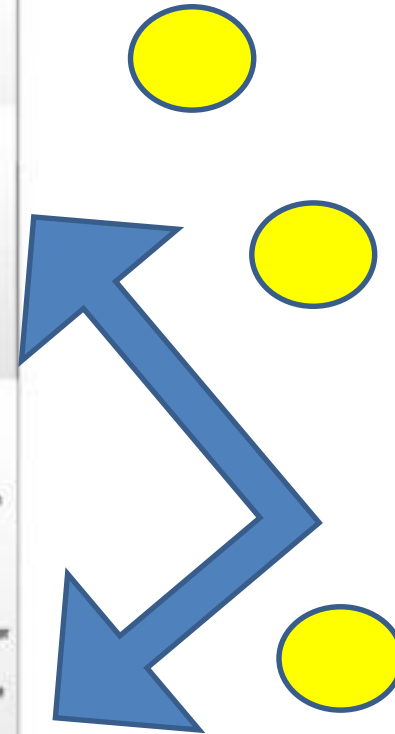
PROJECT PREPARATION PERIOD


PROJECT TERM

Similar to the now familiar PPP project cycle for national and provincial government, the Municipal Finance Management Act's PPP regulations, promulgated on 01 April 2005, provide a clear PPP path for municipalities to follow.

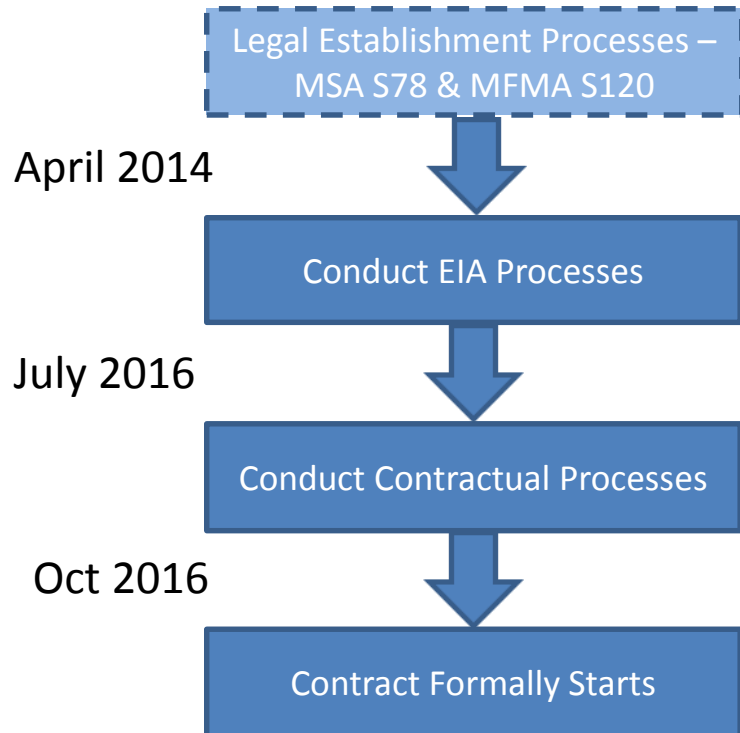
But instead of 'Treasury approvals' as required under the Public Finance Management Act, the MFMA requires Treasury 'views and recommendations' on the feasibility study, the procurement documentation and the terms of the negotiated PPP agreements prior to signature.

Here are the regulated steps which the municipality must follow

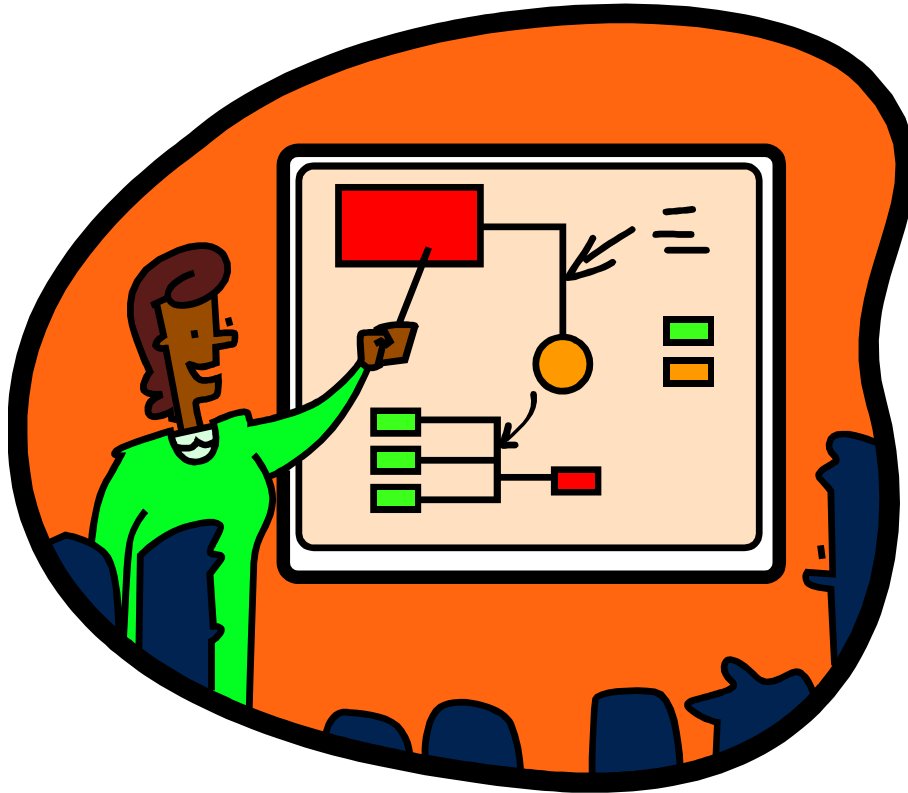


 = Process completed

Expected EIA & Contractual Processes

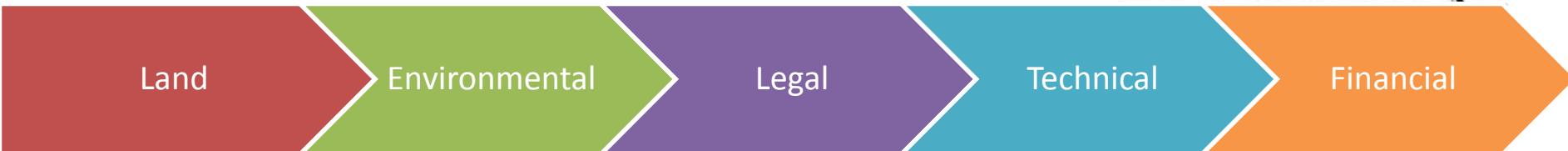


Milestones for Waste to Energy





4. PROJECT DEVELOPMENT



Legal Right to land

- Title Deed OR
- Notarial lease OR
- Option, lease or sale agreement

Land Use Rights

- Land use change
- Subdivision
- Rezoning

NEMA authorisation Environmental Report

- EIA
 - Specialist reports
 - Objections
- Record of Decision and construction permit*

Water allocation

Other

- Agricultural
- Heritage

MOI Shareholders agreements

Concession Agreement of Fuel Supply

Power purchase agreement

- Price and volume for a period of loan tenure x 1.5*
- By-product(if applicable)
off-take Agreements**
Supported by sustainability analysis
- CERs
 - Digestate, Heat or Ash

- Heads of terms**
- Primary
 - EPC
 - O&M
 - Project Insurance package
- Technology with appropriate process guarantees*

NERSA Generation Licence

Grid Connection Forecast Energy sales

Project Schedule

- Detailed engineering design**
- Water consumption
 - Capex
 - Design specifications

Contracting capability

Price Base Case Financial Model

- Funding**
- Equity
 - Debt

Board Resolutions Letters of Support

Termsheets

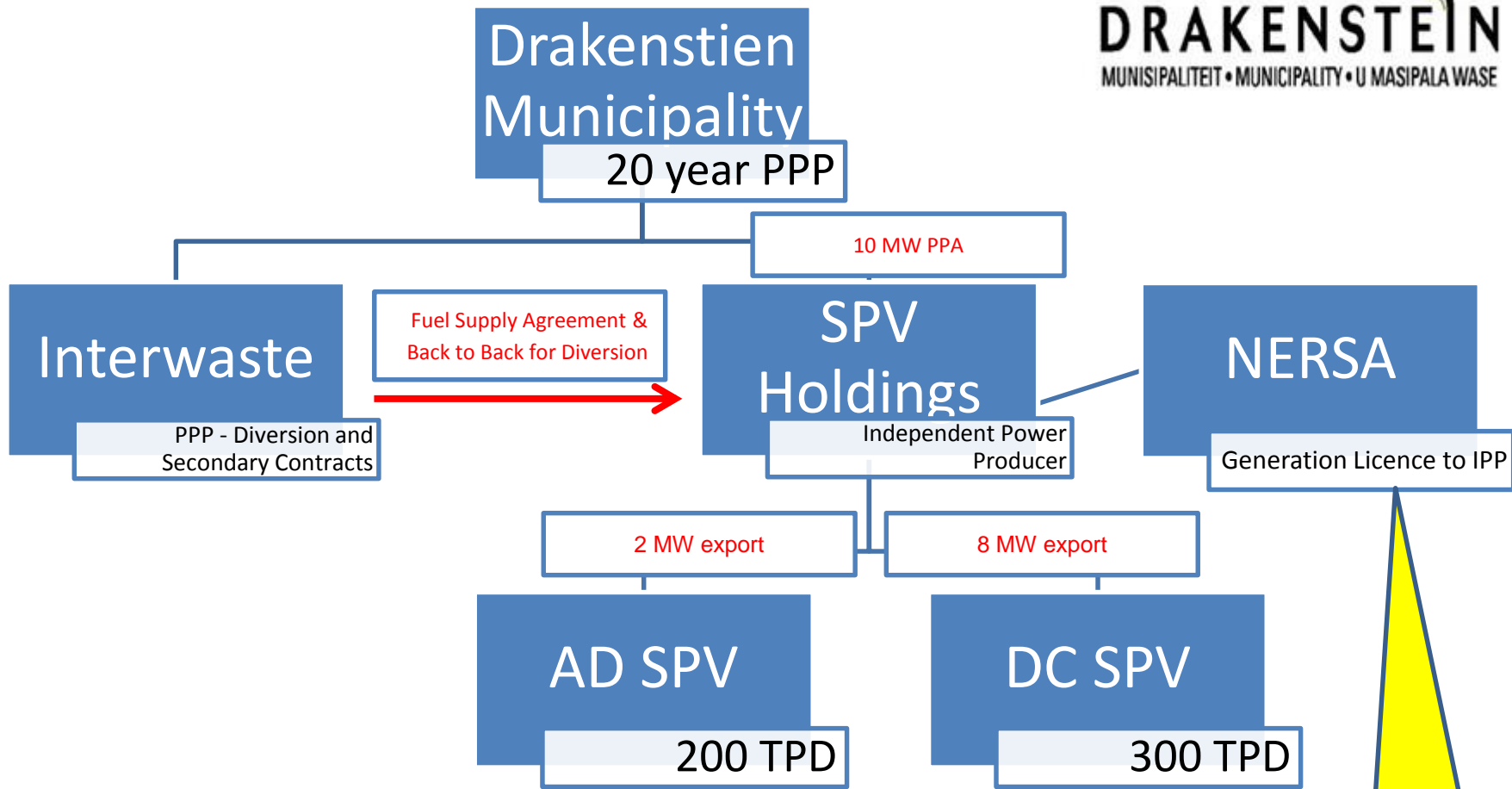
- Register on IRP
- Register as IPP
- Conclude PPA



Proposed Drakenstein Structure



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- Register on IRP
- Register as IPP
- Conclude PPA



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COMPARING EMISSIONS WITH STANDARDS



Comparing Dioxin Contents

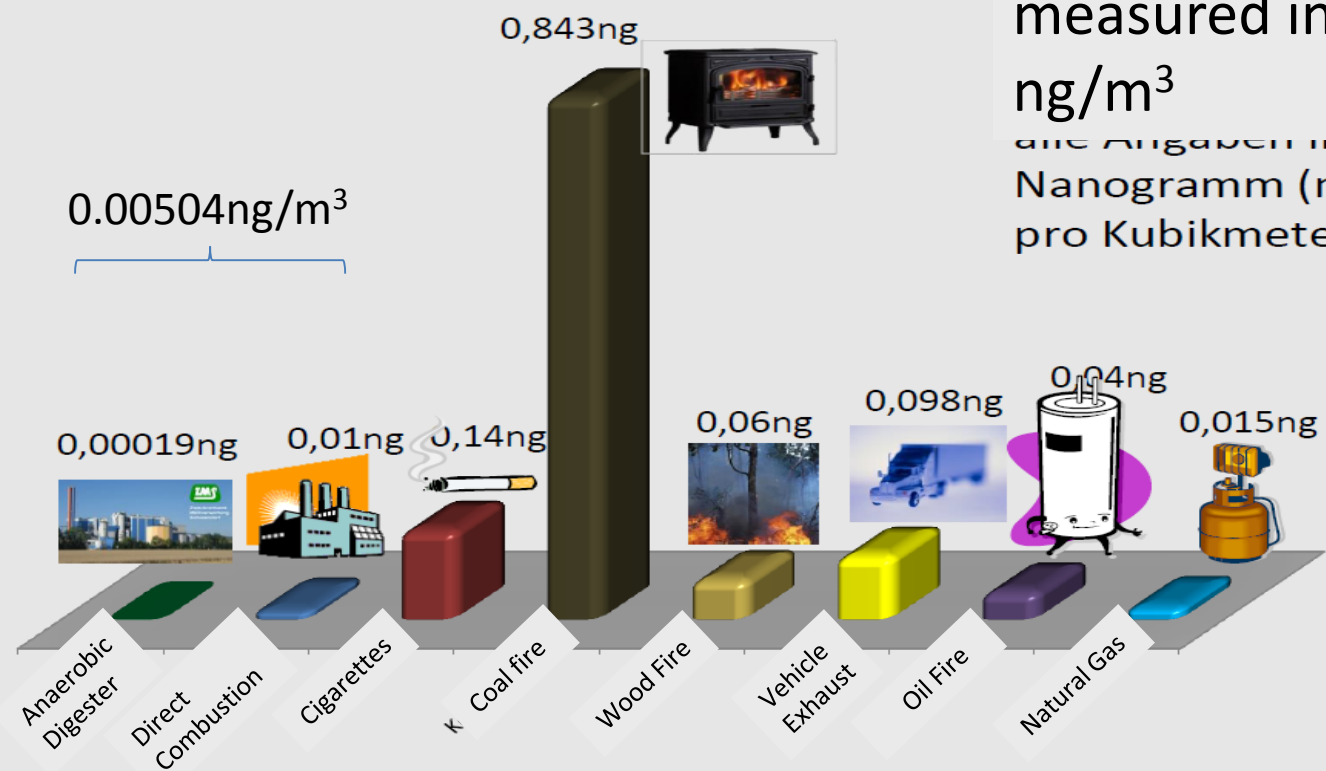


ZWECKVERBAND
MÜLLVERWERTUNG SCHWANDORF



Dioxinmessungen im Vergleich

All values measured in ng/m^3
alle Angaben in Nanogramm (ng) pro Kubikmeter m^3





Comparing Emissions with World Specifications



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Emission Standards					
Parameters	RSA Standard	Korea Standard	Expected Value	Value of KKIEC's Designed Plant in Korea	
				SangGae Plant	SungNam Plant
				in Seoul	in Seoul
Dust(mg/Nm3)	10	30	10	4.1	1.99
HCl (mg/Nm3)	10	20	10	0.9	1.85
SO2 (mg/Nm3)	50	30	20	1.5	1.24
NO2 (mg/Nm3)	200	70	50	24.9	47.96
CO(mg/Nm3)	50	50	30	Below 30	Below 30
Heavy Metals (Pb/As/Sb/Cr...)	0.5	0.5	0.3	Below 0.3	Below 0.3
Dioxin and Furan (mg-TEQ/Nm3)	0.1	0.1	0.1	0.054	0.03



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WAY FORWARD FROM HERE



Abbreviations

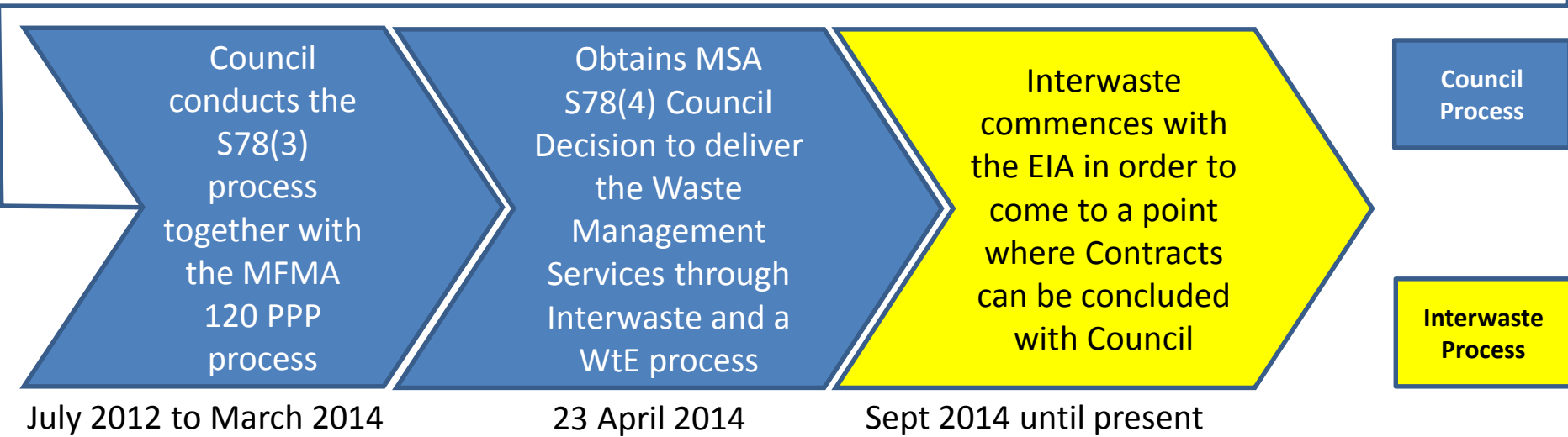
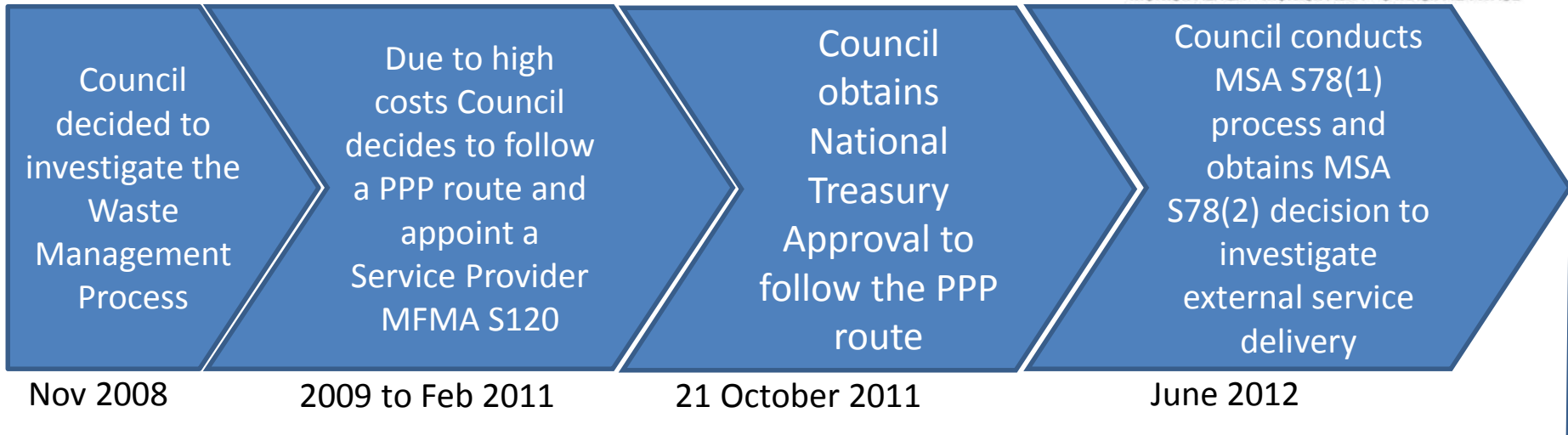


- **“AEL”** means Air Emissions License;
- **“CA”** means Communication Activities;
- **“DMR”** means Department of Mineral Resources;
- **“EAP”** means an environmental assessment practitioner as defined in section 1 of the Act;
- **“EAR (environmental audit report)”** means a report contemplated in regulation 34;
- **“EIA (environmental impact assessment)”**, means a systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR;
- **“EIAR (environmental impact assessment report)”** means a report contemplated in regulation 23;
- **“EMPr”** means an environmental management programme contemplated in regulations 19 and 23;
- **“PPP”** means a Public Private Partnership
- **“MSA”** means the Municipal Systems Act;
- **“MFMA”** means the Municipal Finance Management Act
- **“MPRDA”** means Mineral & Petroleum Resources Development Act;
- **“NEMA”** means National Environmental Management Act;
- **“S&EIR”** means the scoping and environmental impact reporting process contemplated in regulation 21 to regulation 24;
- **“WML”** means Waste Management Licence;
- **“WUL”** means Water Use Licence;
- **“WULA”** means Water Use Licence Application.



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Process Overview Thus far





EIA Process – EAP & Specialist Appointments



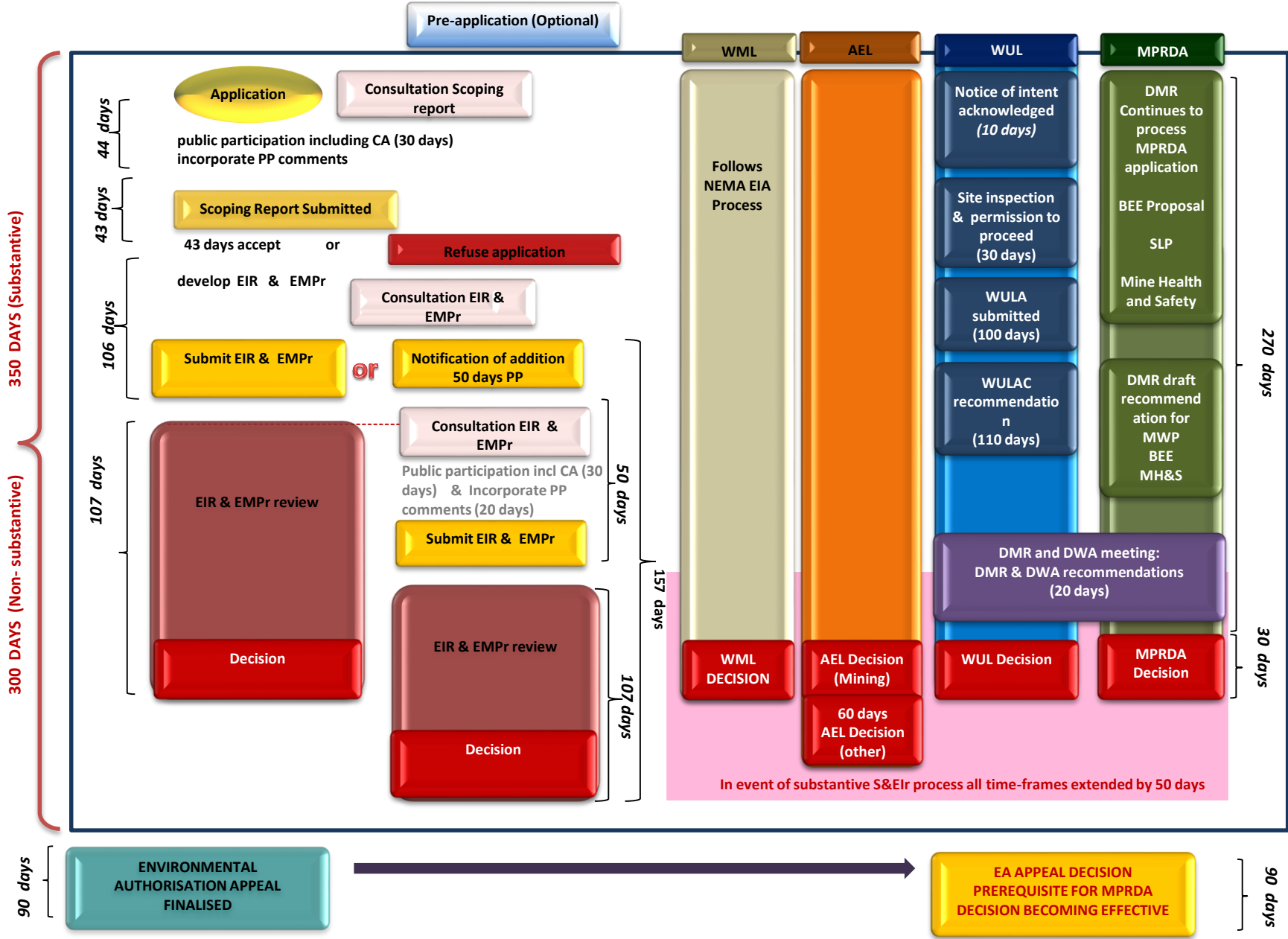
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Regulation 13(1): An EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must-

- a) be independent;
- b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these regulations and any guidelines that have relevance to the proposed activity;
- c) ensure compliance with these Regulations;
- d) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- e) take into account, to the extent possible, the matters referred to in Regulation 18 when preparing the application and any report, plan or document relating to the application; and
- f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing

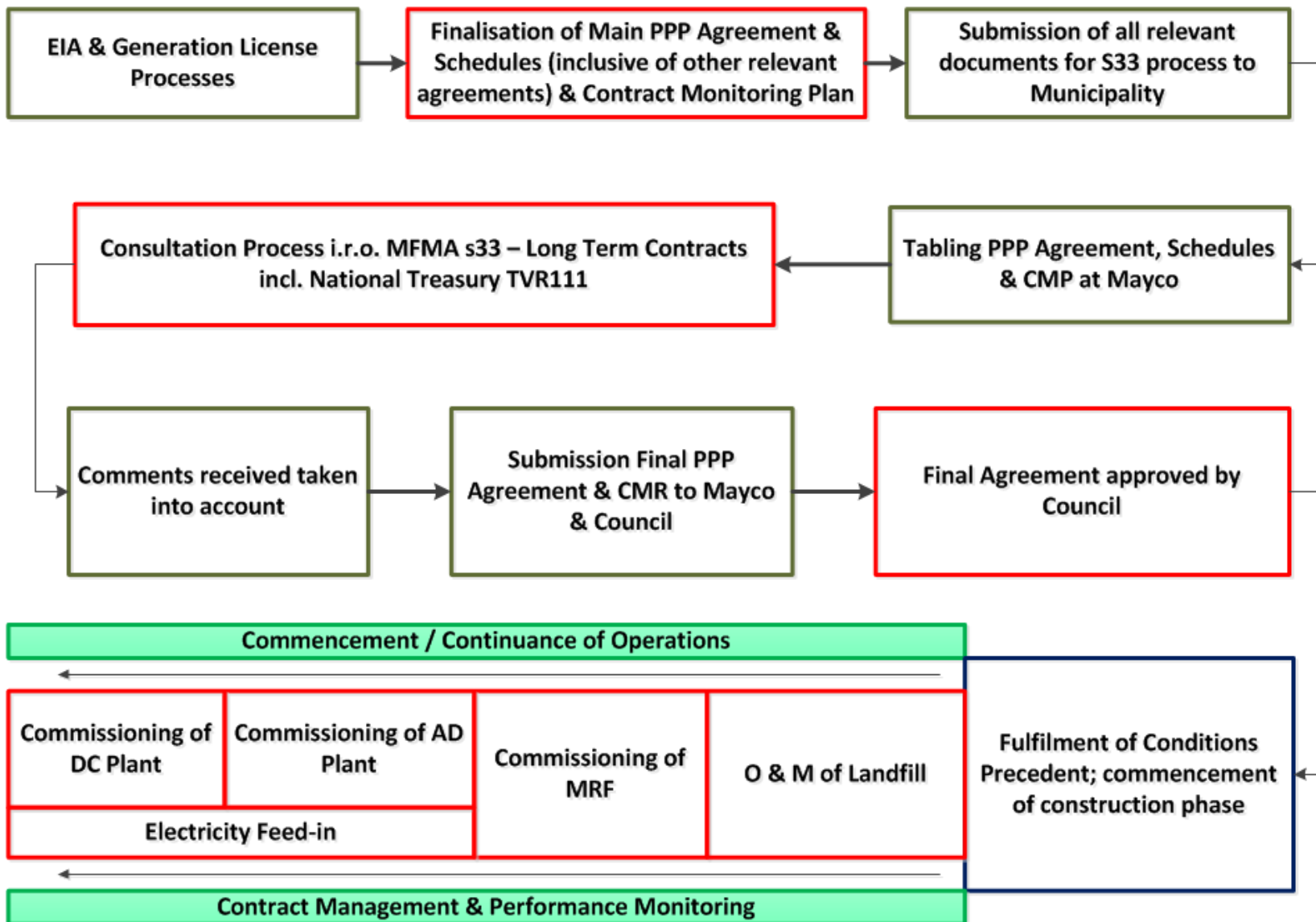


S&EIR Process





Statutory Compliance & Contractual Phase: Municipal Perspective





Summary of EIA Process

Thus far



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Activity	Date
Submit Application to DEA	4 July 2014
Acknowledgement of Receipt of Application (DEA)	1 August 2014
Advertising the availability of a Background Information Document (BID) and 21-day I&AP registration & commenting period in one (1) local newspaper (PaarlPost) and one (1) regional newspaper (Die Burger)	Thursday 7 August 2014 – Friday 29 August 2014
Advertising the availability of a Draft Scoping Report (DSR), Public Open Day and 40-day I&AP registration & commenting period in one (1) local newspaper (PaarlPost) and one (1) regional newspaper (Die Burger)	Thursday, 20 November 2014 (Paarl Post) and Friday, 21 November 2014 (Die Burger)
Notification via registered and electronic mail to neighbouring landowners and stakeholders on preliminary stakeholder database	Week of 17 November 2014
Placement of reports in Paarl Public Library. Posters placed as required.	Week of 24 November 2014
40-day review and comment period on Draft Scoping Report	Tuesday, 25 November 2014 – Monday, 2 February 2015
Public Open Day at Windmeul Cellar	Thursday, 22 January 2015
Final Scoping Report circulated for the required minimum 21 day review period	Monday 27 July – Friday 21 August 2015
Advertising the availability of the Final Scoping Report (FSR), Public Open Day and 40-day I&AP registration & commenting period in one (1) local newspaper (PaarlPost) and one (1) regional newspaper (Cape Times)	Week of 20 July 2014
Placement of reports in Paarl Public Library.	Friday 24 July 2015



Summary of Future EIA Processes



Activity	Date
Final Scoping Report submitted to DEA	September 2015
Alternative Site Screening and Ranking Process	August – September 2015
Environmental Impact Assessment Phase: Specialists undertake studies	September – December 2015
Advertising the availability of the Draft Environmental Impact Report (DEIR), Public Open Day/Meeting and 40-day I&AP registration & commenting period in one (1) local newspaper (PaarlPost) and one (1) regional newspaper (Die Burger/Cape Times)	February 2016
Notification via registered and electronic mail to neighbouring landowners and stakeholders on preliminary stakeholder database	February 2016
Placement of DEIR in Paarl Public Library. Posters placed if required.	February 2016
30 - 40-day review and comment period on Draft Environmental Impact Report	February – April 2016
Public Open Day/Meeting (venue to be confirmed) + Authorities Meeting	February - March 2016
Final Environmental Impact Report (FEIR) circulated for the required minimum 21 day review period	April – May 2016
Final Environmental Impact Report (FEIR) submitted to DEA. AEL application included.	May 2016
Authority Acceptance of FEIR and Decision	Aug – Sept 16
Appeal Process and Decision on Appeal	?

WASTE DISPOSAL AND BENEFICIAL USE PERCENTAGES FOR SELECTED COUNTRIES (GOLDSMITH-JONES ET AL., 2009)

Country/Province	Waste (kg/pp/yr)	Landfill (%)	Reuse / Recycling (%)	Waste-to-Energy (%)	Compost (%)
Sweden	518	4	47	37	12
Denmark	801	5	53	24	17
Germany	564	1	35	46	18
France	541	34	36	16	14
Netherlands	630	3	38	32	28
United Kingdom	572	57	9	22	12
Canada	1037	74	2	24	
South Africa*	381	88	10	1	2
Western Cape*	675	83	10	2	5



Similar WtE Plants Elsewhere in the World (...1)



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Bolton

Location: Lancashire

Operator: Greater
Manchester Waste Ltd

Configuration: 1 X 10 MW

Operation: 2000

Fuel: refuse

Boiler/incinerator system
supplier: Volund

T/G supplier: Ansaldo

Quick Facts: The plant was
converted from a mass-
burn incinerator to a WtE
plant in 2000. The capacity
of the plant is about
120,000 tons MSW/yr.





Richmod Hill

Location: Isle of Man

Operator: SITA Waste (IOM) Ltd

Configuration: 1 X 6.7 MW

Operation: 2004

Fuel: refuse

Boiler/incinerator system supplier:
BBP

T/G supplier: B+V

EPC: Sita, Kvaerner

Quick Facts: This plant is owned by the Manx Department of Infrastructure and managed by SITA . It has two incinerators; the primary incinerator uses a water-cooled grate and a secondary incinerator can handle up to 5,000 tonnes of clinical, animal and oil waste. In combination, the facility processes all of the Island's residual domestic and commercial waste and produces approximately 7% of the Island's electricity.

Similar WtE Plants (...3)



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Strasbourg

Location: Bas-Rhin

Operator: Tiru

Configuration: 1 X 22 MW CHP

Operation: 1995

Fuel: refuse

Boiler/incinerator system supplier:

Von Roll, SACM

T/G supplier: Alstom

EPC: Tiru

Quick Facts: This plant started up in 1974 and operation was taken over by Tiru in 1995. Ownership is by Tiru (66%) and Electricite de Strasbourg (34%). Nominal capacity is 350,000 tpy with waste gathered from 27 municipalities in the Strasbourg area. The plant has four treatment lines

Similar WtE Plants (...2)





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QUESTIONS