“Case studies on PPPs of Waste-to-Energy Projects”
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WTERT-US and the Global WTERT Council (GWC)

- WTERT-U.S. was founded by the Earth Engineering Center of Columbia University with the help of the U.S. WTE industry in 2002

- At the end of 2011, GWC was incorporated as a non-profit organization under the laws of the state of New York and the U.S.A.
The mission of the Global WTERT Council (GWC):

- Identify the best available technologies for the recovery of materials and energy from all types of “wastes”

- Assist nations in advancing sustainable waste management and improving the public health and quality of life by taking into account the local/ regional characteristics of each case

- Conduct research and development as required, and

- Disseminate this information by means of its publications, the web, and periodic meetings.
PPP Project: Dublin Waste to Energy plant
Dublin Project profile

- Dublin City Council (four Dublin Local Authorities) and U.S. Company Covanta
- Funding: $110 million by municipality
- Capacity: 528,000 tons MSW/year
- Electricity generation: 61 megawatts (electricity and heat for 80,000 homes)
- Plant operation of the plant replaces about 250,000 tons of fossil fuels per year.
- 100 new jobs were created. Over 300 jobs created during construction.
Planning stages (1st phase) and the role of public

• December 1997: Dublin SWM strategy: ‘Changing our ways’:
  – Extensive public consultation
  – The four Dublin Local Authorities approved the strategy

• October 1998: Draft Plan was distributed for public comment

• December 1998: A final version of the plan, was adopted by Dublin Corporation.
  – An Environmental Awareness Officer was appointed for the first time in the history of the State

• January 1999: Feasibility study for thermal treatment of waste:
  – Focus groups were used to determine what, are important criteria that must be considered
  – The study identified the site on the Poolbeg Peninsula
Planning stages (2nd phase) and communication

- January 2001: Communication of project
  - Local Communications Coordinator appointed.
  - Information service opened in Dublin Corporation’s Regional Office
- May 2001: Independent Selection Committee appointed
- June 2001: Public Open Day. Promotion of CIG and invitation for applications
- August 2001: Formation of the Community Interest Group (CIG)
  - The role was to reflect the views and concerns that their community have on WTE
  - It consisted of 18 men and women selected by an Independent Selection Committee
- April 2002: CIG Report and Environmental Scoping Document completed
The mission of the Global WTERT Council (GWC):

Planning stages and Public opposition- NIMBY

• November 2007: Planning approval

• December 2008: Waste license by the EPA:
  – The Environmental Scoping was discussed with the public. The CIG was instrumental.

• September 2009: Authorizations from the Commission for Energy Regulation

• December 2009: Dublin City councilors voted not to proceed with the construction
  – The decision was not put into effect, but delayed the project for 5 years.
  – The action against was considered a politically driven action.

• October 2014: Construction work commenced

• March 2018: Construction completed.

• Start up: 18 years after initiation: One reason for high capital investment in EU/US new WTE plants
Mitigation of NIMBY phenomenon in Dublin

• The role of the CIG was significant to disseminate the information:
  – Coordinated forums: Citizens could voice their concerns or opposition to the project.
  – Hosted Open Day meetings to inform the public about latest updates.
  – Organized meetings with international experts and presentations on the benefits of WTE.
  – Publication of reports.

• The municipality set targets that included WTE, and works with the public:
  – Establishment of green points,
  – Survey on Integrated Approach: 72% of Dubliners agreed (Lansdowne Market Survey)
  – Committed to reduce and strictly monitor the dioxin emissions from industries.

• Campaigns to raise the awareness for reusing, recycling and WTE:
  – Wastewise monthly newsletter
  – Distribution of brochures with information on the benefits of IWM
  – Waste reuse in primary schools. Recycled Orchestra. Concerts to promote IWM.
PPP Project: Singapore WTE
WTE plant in Singapore

- Between the National Environment Agency (NEA) of Singapore and Keppel Sheghers
- 264,000 tons of urban waste per year: 22 MW of electricity
- Occupies 1.6 hectares of land
- Plant developed in 2006 and it is operational since October 2009
- Keppel Seghers is responsible for O&M for 25 years
The mission of the Global WTERT Council (GWC):

**Singapore WTE: Government assistance**

- Introduced Incineration Services Agreement (ISA) to support investments
- Adopted DBOO (Design, Build, Own, Operate) scheme with full ‘take-or-pay’ approach
- Special Purpose Company (SPC) was formed with the government and the developer
- Government to collect gate fee to finance and pay SPC
- Government mandated electricity to be provided by WTE power plants
- Secure Power Purchase Agreement (PPA) for the export of electricity to grid
- Government may step in and take over if SPC is unable to render service
- A concession of operating plant for 25 years
Singapore project: No NIMBY reaction: Strong political will and clear plan

• Mr Teo Chee Hean, in the 1970s emphasized on proper WTE:
“With just 700 km$^2$ and a high population density Singapore needed to find an alternative to the land-intensive method of landfilling waste”.

• National Environmental Agency (NEA) of Singapore aims of building a sustainable quality environment in land-scarce country by incorporating many space saving and technologically advanced features.
PPP Project: WTE plant of West Palm Beach, Florida
• Initiated an updated 20-year plan to advance SWM of Palm Beach County
• Included the expansion of the waste to energy (WTE) processing capacity.
• In October 2008, the Authority Board approved the 3,000 TPD facility.
• Completed in July 2015.
• The total project cost was $672,000,000 or $672 per ton of capacity.
• Represents the largest WTE project in the US.
• It produces 575 KWh of electricity per ton of processed waste.
• Total revenue from the selling of electricity of $18MM/yr.
• The plant is located on a 24-acre site.
## West Palm Beach WTE: Actors and responsibilities of business model

<table>
<thead>
<tr>
<th>Responsible party</th>
<th>Responsibilities</th>
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</thead>
<tbody>
<tr>
<td>Solid Waste Authority of Palm Beach County</td>
<td>Plant owner</td>
</tr>
<tr>
<td>The Babcock and Wilcox Co. (B&amp;W)</td>
<td>Construction consortium leader</td>
</tr>
<tr>
<td>KBR Inc.</td>
<td>Construction, engineering, and balance-of-plant equipment</td>
</tr>
<tr>
<td>B&amp;W Power Generation Group</td>
<td>Operation and maintenance services provider under 20-year contract</td>
</tr>
<tr>
<td>ARCADIS</td>
<td>Owner engineer- provided design criteria, environmental permitting, and monitored construction</td>
</tr>
<tr>
<td>B&amp;W KVB-Enertec</td>
<td>Supplied continuous emissions monitoring system</td>
</tr>
<tr>
<td>B&amp;W Volund</td>
<td>Supplied boiler grate system</td>
</tr>
<tr>
<td>CDM Smith</td>
<td>Civil works, buildings, wastewater treatment, and fire system subcontractor</td>
</tr>
<tr>
<td>Emerson</td>
<td>Supplied ovation distributed control system</td>
</tr>
<tr>
<td>General Electric</td>
<td>Supplied turbine and generator set</td>
</tr>
<tr>
<td>Konecranes</td>
<td>Supplied refuse cranes and crane automation system</td>
</tr>
<tr>
<td>SPX Cooling Technologies Inc.</td>
<td>Supplied air-cooled condenser</td>
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NIMBY phenomenon and actions against West Palm Beach Project

- Non-Profit “environmental” Organizations, e.g. Sierra Club
  - SWA published a special report as a response;
  - SWA organized public consultation meetings, and hosted events to inform the public.
- Articles in press, e.g. NY times, Jan 10, 2015, etc., against the development
  - The SWA published reports an
d articles on the benefits of WTE
- Residents of Ironhorse Country Club, NW of the facility
  - Presented the results of the dispersion model to the community
PPP Project: Enerkem in Edmonton, Alberta Waste-to-Biofuels-and-Chemicals facility
• Partnership: City of Edmonton & Alberta Innovates, Energy and Environment Solutions

• Construction and operation created 610 and 152 direct and indirect jobs, respectively.

• A net total economic impact of $199 million

• The calculated reduction in (GHG) is equivalent to 110,000 tons of CO2 per year

• Single-line methanol-ethanol production commercial facility

• Initiated production of methanol in 2015 and ethanol in 2017
Responsibilities of involved actors in Enerkem project

**Municipality** (Public consultations; Assurance with more stringent regulations):

- Supplies 100,000-400,000 tons of post-sorted MSW per year (long-term contract)
- Pays tipping fee – attractive compared to status quo
- Suggests sites

**Enerkem** (Manage risk, incl. sale of final product):

- Invests approx. $100M to build, own and operate the biorefinery
- Produces 38 to 152 MLPY of biofuels/biochemicals
- Works with the city to optimize MSW sorting into commodities and for site selection
The mission of the Global WTERT Council (GWC):

Benefits:
- Waste is seen as an opportunity in Alberta and is considered as a valuable product.
- The production of biofuel will contribute to at least 5% of biofuels to the market.

Reality:
- The operation of the plant faced significant difficulties.
- It was planned to start operations in 2012 at a cost of $80 million
- In 2018 had not operated continuously for at least six months
- The total cost amounted to $120 million
- Many lawsuits from suppliers still pending

In contrast:
- Construction of plant in Rotterdam; part of a consortium with the Port of Rotterdam.
- Agreement with a Chinese Group worth over $125 million. The joint venture planned to build over 100 Enerkem facilities in China by 2035.
PPP Project: Tees Valley, U.K., Renewable Energy Facility (Tees Valley 1 and 2)
Tees Valley Renewable Energy Facility
(Tees Valley 1 and 2)

• Located at the New Energy and Technology Business Park, Teesside, NE England.
• The key players were: Air Products, Westinghouse, and the Stockton Borough Council.
• Stockton Borough Council approved the plan in 2011, to start operating in 2014
• The environmental permitting was consented from the Environment Agency.
• Create 700 and 50 jobs during construction and operation, accordingly.
• The plant had a designed capacity of 300,000 tonnes of waste (largest in the world)
• Production of 49MW of electricity (~50,000 homes).
• Westinghouse plasma to vitrify the residues
Approaching the NIMBY phenomenon in Teesvalley

- Air Products consulted with local stakeholders and people living in the area.
- It consulted local and national organizations.
- July 2010: Presented the plans to local residents and businesses.
- October 2010: public exhibitions in the area and leaflets to more than 7,500 houses.
- Support from the regional development agency
- Support from various local organizations and from local MPs.
- Air Products worked with local firms in its construction and operation.
Failure of Teesvalley project due to technical issues

• Resulted in the loss of about 700 jobs.
• Cost between US$900m–US$1bn of its assets.
• The company discontinued its Energy from Waste business segment.
To sum up:

- **Mitigation of NIMBY** is important to reduce the capital cost of WTE.
- Besides the **business models** and the **financial support**, **technology** is also **key** for success.
- **Combustion for the direct production of energy**, in the form of electricity and/or district heating/cooling and/or industrial steam, is the only **proven and dominant technology** for the thermal treatment of waste in ~1,000 plants in the world.
Reasons for NIMBY: WtE is against Circular Economy (5 reasons why WTE is vital for CE)

1. Produces energy from waste that cannot be recycled, and it is typically landfilled.
2. Successful examples of the world have proved that recycling goes hand in hand with WTE.
3. WTE is key to remove hazardous materials out of CE.
4. Allows recovery of metals and minerals from non-recyclables.
5. Saves land and GHG over the only alternative for the post-recycled waste, that is landfiling.
Changes in EU generation and disposition of MSW 1995 to 2015 (Eurostat data)

2015 MSW generation: 243 million tons; 2015 EU population: 510 million
y-axis: kg per capita (Figure by Eurostat and EEC-Columbia University)
Taiwan WTE Observation Deck on Stack
Worldwide examples: Copenhagen, Denmark
Worldwide examples: Spittelau, Vienna, Austria
To be built in Shenzen, China. The world’s largest (1.6 million tons)
Leeds, UK (214,000 tons/year)
Brescia, Italy (700,000 tons/ year)
Thank you for your attention!

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References

2. https://www.covantadublin.ie/