



## **Renewable Energy**

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# Agenda – Renewable Energy

- ▶ 1. Waste-to-Energy
- 2. Landfill-Gas-to-Energy
- 3. Energy Price Strategy

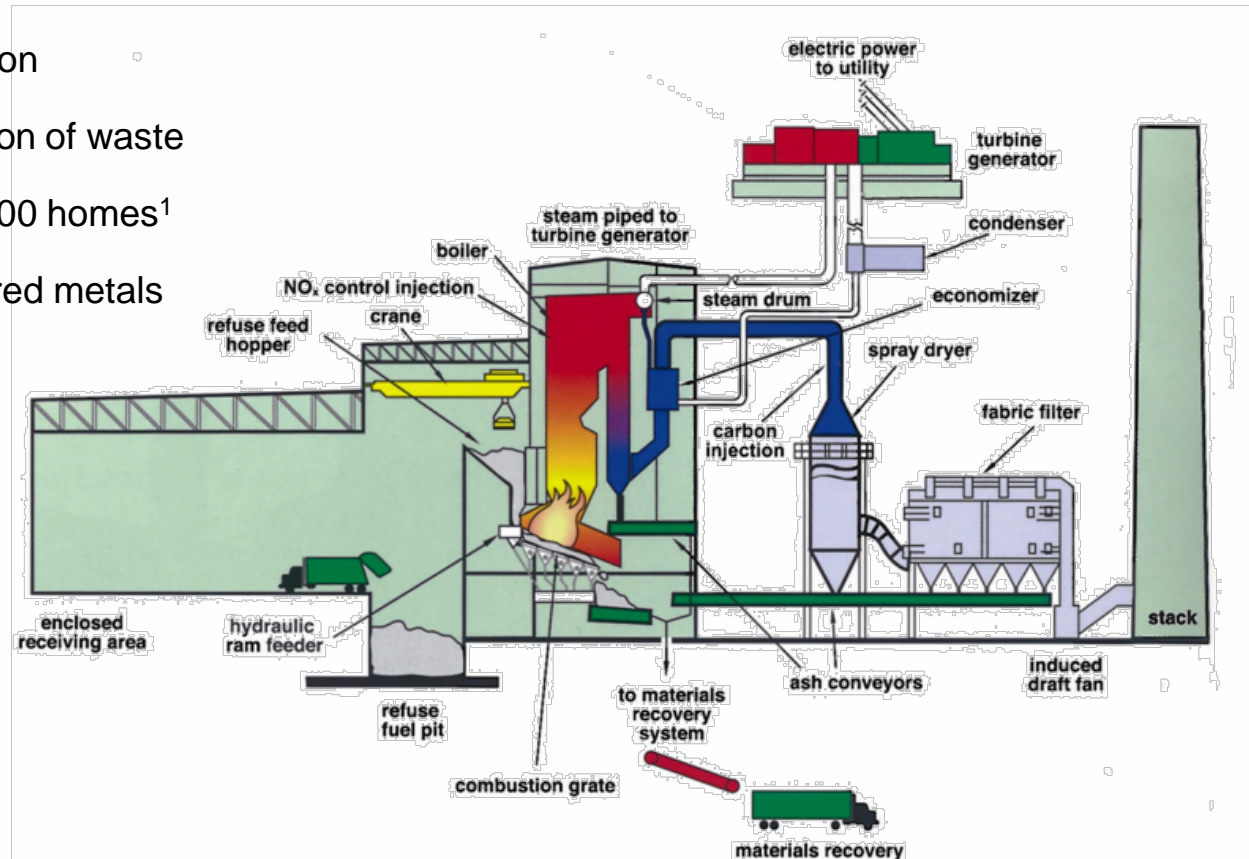


# Introduction

- For the past three decades, Wheelabrator (WTI) has been a leading operator of waste-to-energy (WTE) and other power generation facilities reliant on renewable waste fuels with a revenue of \$840 million in 2009 and 1,100 employees.
- As of January 1, 2010, in more than three decades, WTI has:
  - processed over 165 million tons of municipal solid waste (MSW).
  - generated 86 billion kilowatts of clean, renewable electricity, avoiding the use of 165 million barrels of oil or 43 million tons of coal that would have been used to produce that amount of electricity.
- 23 power plants have a total capacity of 27,540 tons per day (TPD) and 885 MW – generating power for one million homes.
- Extending WTI's expertise to domestic expansion and international markets is a logical next step and is core to our forward strategy.

# Outline of a WTE Plant

- 90% waste volume reduction
- 70% waste weight reduction
- Energy output: 550 kWh/ton of waste
- Generates power for 40,000 homes<sup>1</sup>
- 2% of waste input recovered metals
- 50 years of useful life

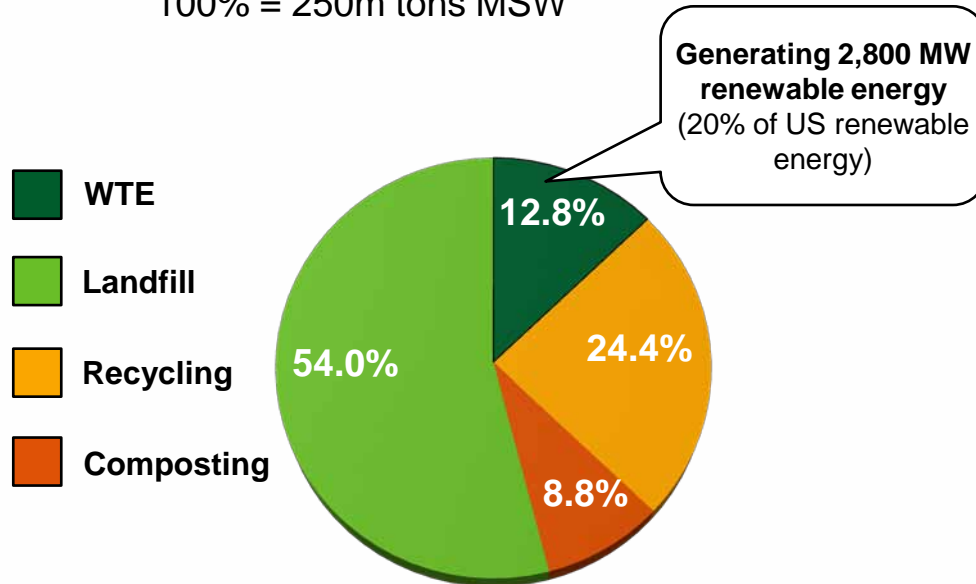


<sup>1</sup>Based on a typical 1,500 TPD plant

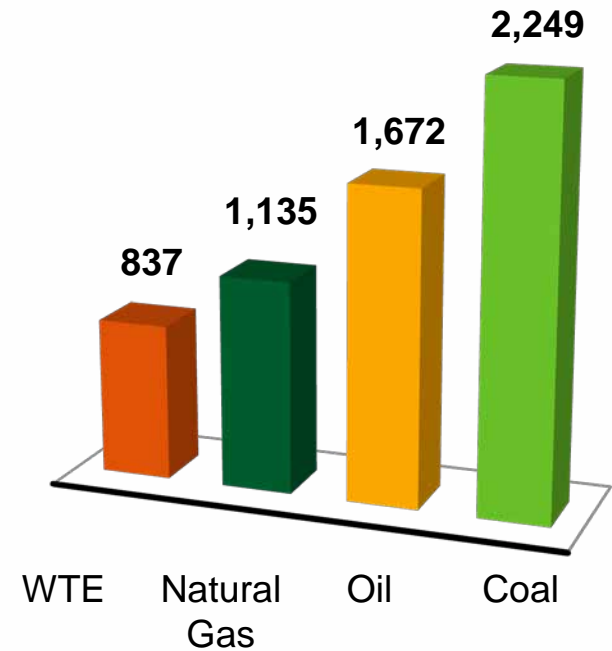
# WTE in the U.S.

## Municipal Waste Treatment in 2007

100% = 250m tons MSW



## Air Emissions (pounds CO<sub>2</sub> per MWh)



Every ton of waste processed at a WTE plant prevents one ton of CO<sub>2</sub> equivalents from entering the atmosphere



# WTI's Contribution to WM in 2009

## Energy generation

- With 885 MW, WTI generates 62% of WM's renewable energy output

## Waste volume treated

- WTI has a disposal capacity of 7.3 million tons per year – 8% of WM's total 93.3 million tons of waste under management

## Employees

- WTI employs 1,100 of WM's 43,000 employees

## Revenue

- WTI contributes \$ 840 million of revenue to WM's total revenue of \$ 11.8 billion in 2009

# Asset Portfolio

## WTE Facilities

- 16 facilities across the US
  - Capacity: 21,340 TPD, 609 MW
  - Waste processed: 7.0m tons annually
  - Power distributed: 3.9m MWh annually
  - Average asset age: 21 years; Average asset life: 50 years
- 2 facilities in China; Capacity: 2,700 TPD, 49 MW

## Independent Power Plants

- 5 facilities across the US (fuel sources include wood, tires, culm, natural gas, landfill gas and oil)
  - Capacity: 3,500 TPD, 227 MW
  - Waste processed: 1.25m tons annually
  - Power distributed: 1.25m MWh annually
  - Average asset age: 17 years; Average asset life: 50 years

## Other Assets

- US: 3 transfer stations, 1 material recovery facility, 4 ash landfills and 1 landfill gas project
- China: 5 transfer stations, 5 landfills, 1 wind farm

# U.S. Asset Locations



Baltimore, MD



Bridgeport, CT



Claremont, NH



Concord, NH



Falls Township, PA



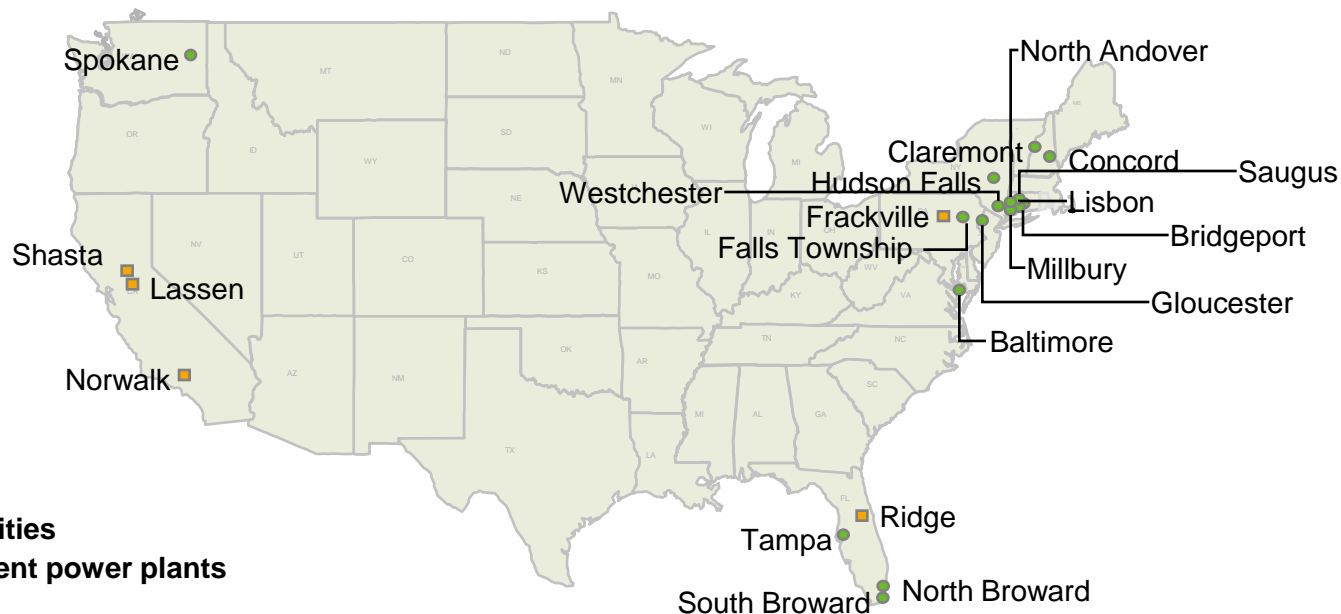
Gloucester, NJ



Hudson Falls, NY



Lisbon, CT



Tampa, FL



Millbury, MA



North Andover, MA



North Broward, FL



Saugus, MA



South Broward, FL



Spokane, WA



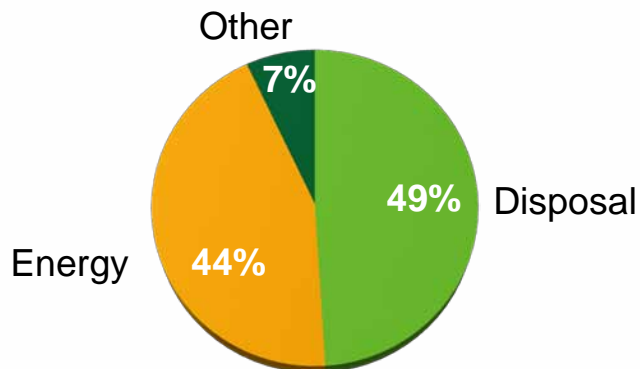
Westchester, NY



# Disposal Revenue in the U.S.

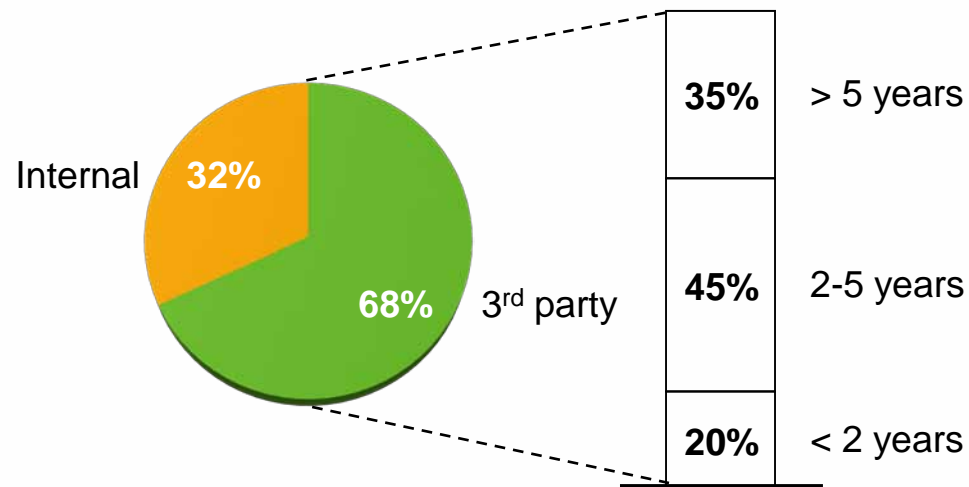
## Revenue Split 2009

100% = \$841 million



## Waste Supply Source 2009

100% = 7.0 million tons



**Contract  
expiration  
periods**

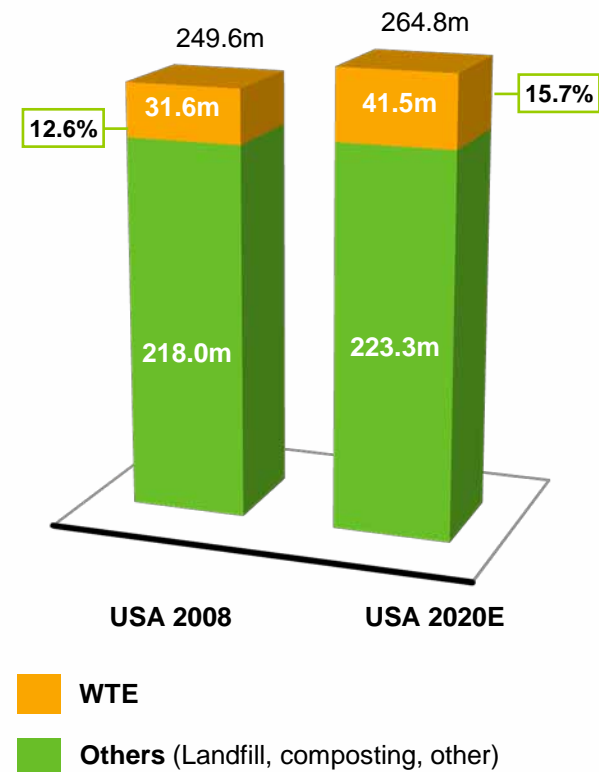
35%	> 5 years
45%	2-5 years
20%	< 2 years

- Average disposal price WTE: \$58 per ton
- Average energy price WTE: \$71 per MWh
- Average energy price IPP: \$81 per MWh

# Growth Opportunities – U.S. (1/2)

- The U.S. is the second-largest market for municipal waste
- Potential for WTE growth in the U.S. is greater than any period over the past 15 years
- WTE offers several advantages leading to significant growth of the industry:
  - Proven technology
  - Close-in solution for municipalities
  - Long-term predictable disposal pricing
  - Customer participates in the forward energy curve to provide an offset to the long-term operating expenses
  - Generation of renewable energy
  - Climate neutral

**Incinerated Volume as % of Total MSW  
(in tons)**



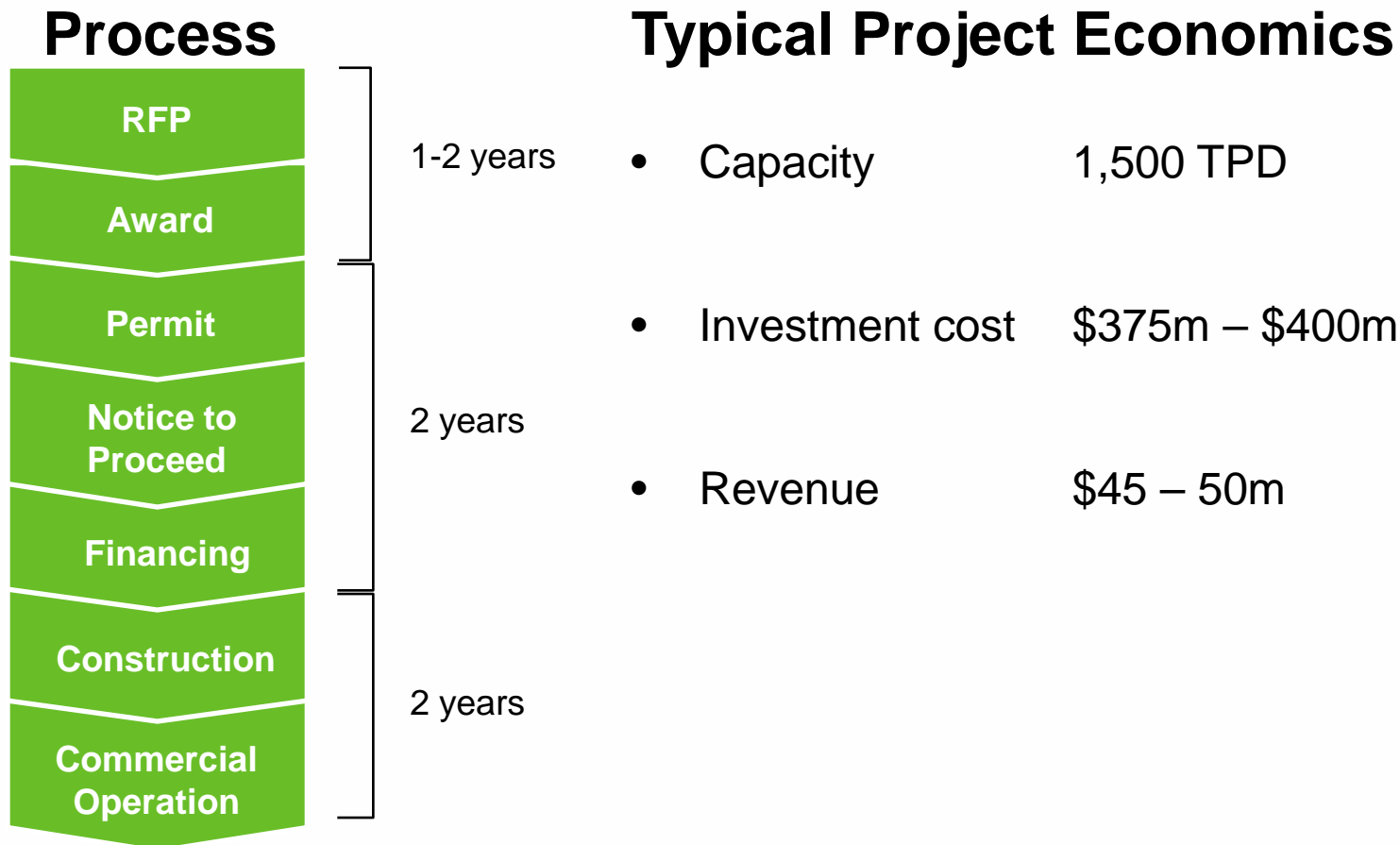
# Growth Opportunities – U.S. (2/2)

- Engaged in 6 new WTE projects across the U.S. with capacities of 9,200 TPD and 190 MW
- Executed purchase agreement for the SPSA 2,000 TPD RDF facility with 175 employees located in Portsmouth, VA with closing expected in March-April WTI was selected against two finalists, Covanta and ReEnergy
- Targeted growth of 1-2 (mostly) DBO projects or operating contracts per year and one acquisition in the next 2-3 years



Project	TPD	Contract	Status
1. Frederick / Carroll Counties, MD	1,500	DBO	Awarded
2. Harford County, MD	1,500	DBO	Preferred vendor
3. Portsmouth, VA	2,000	Acquisition	Selected
4. New Hanover, NC	200	O&M	Short-listed
5. Palm Beach, FL	3,000	DBO	RFP due 6/2010
6. Los Angeles, CA	1,000	DBOO	Short-listed

# U.S. Project Development Cycle and Economics





# Typical WTE Contract Structures

## DBO

Design-Build-Operate

- Financed and owned by the public customer
- Designed, constructed and long-term operated by the private sector

## DBOO

Design-Build-Own-Operate

- Financed, designed, constructed, owned and operated by the private sector
- Client provides long-term waste disposal contract

## DBOT

Design-Build-Own-Operate-Transfer

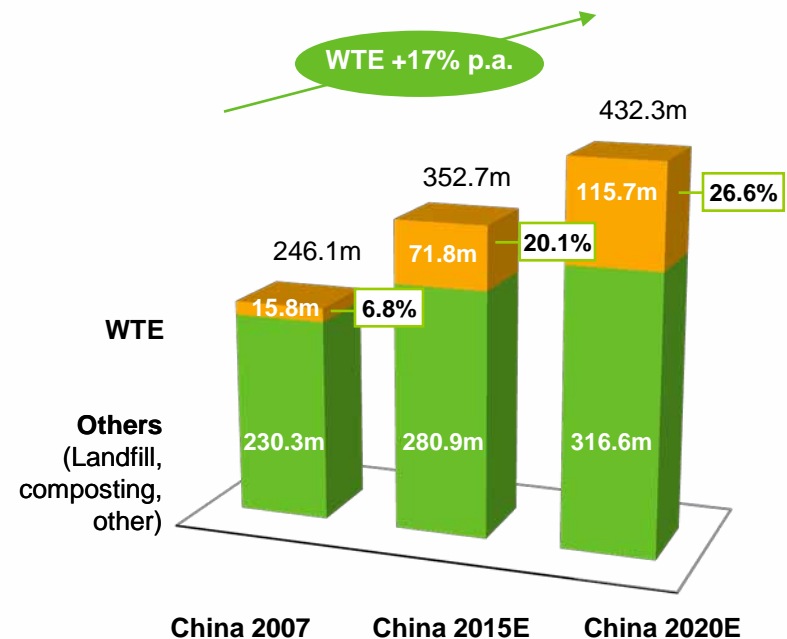
- Financed, designed, constructed, owned and operated by the private sector – project is transferred to client at the end of the disposal contract
- Client provides long-term waste disposal contract

# Growth Opportunities – China

## (1/2)

- China has surpassed the U.S. as the largest waste generator in the world
- Continued rapid economic development, rising incomes and lifestyle changes will increase MSW volumes (expected to increase 4.4% annually until 2020) and composition significantly
- Besides waste volume growth, energy demand, land scarcity in metropolitan regions and public policy promote and require significant infrastructure investments into WTE
- Thus, China is the fastest-growing WTE market globally with 77 operating plants and 96 in construction or planning
- Additionally, 100-130 plants are required over the next 10 years

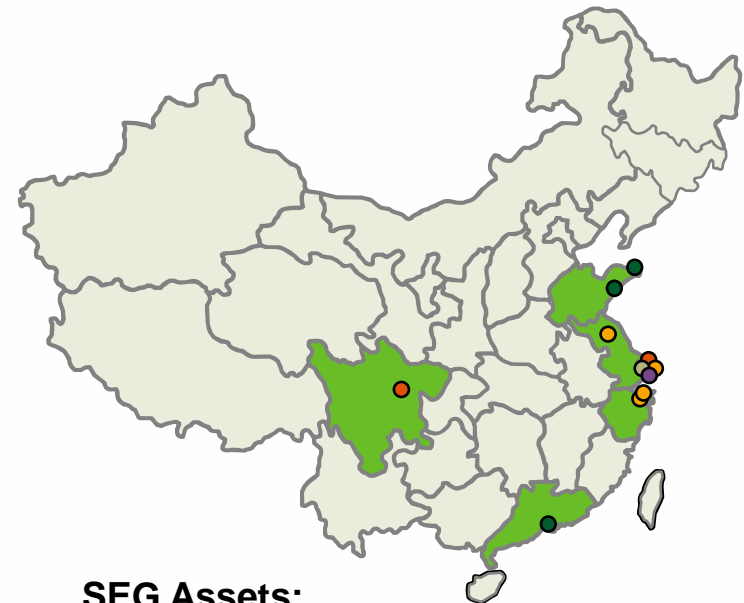
**Incinerated Volume as % of Total MSW  
(in tons)**



# Growth Opportunities – China

## (2/2)

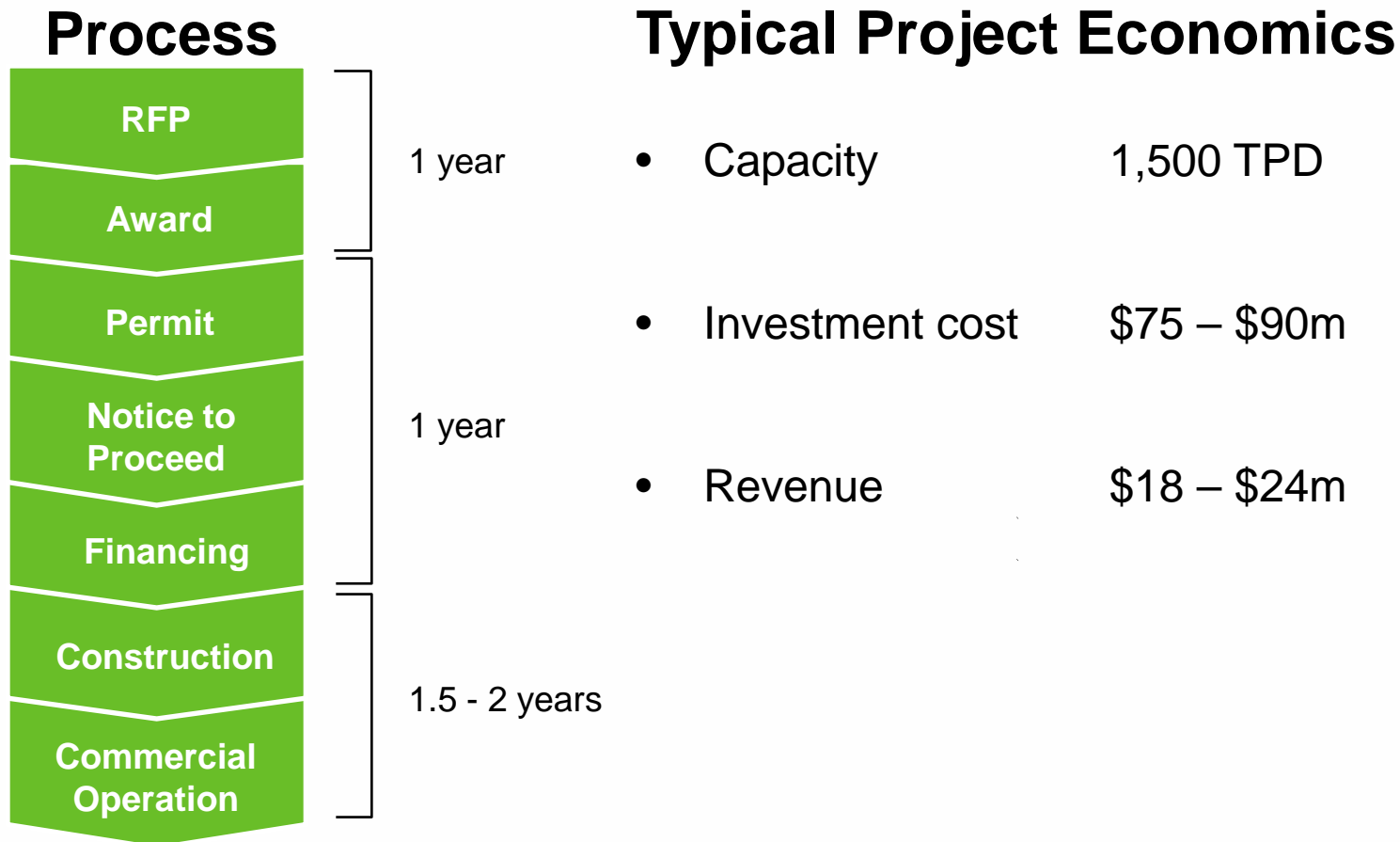
- Acquisition of 40% of Shanghai Environment Group (SEG), a joint venture with Shanghai Chengtuo Holding and market leader for WTE in Eastern China
- SEG's portfolio:
  - 2 operating WTE plants (2,700 TPD, 49 MW)
  - 3 WTE plants under construction (3,400 TPD, 54 MW)
  - 5 transfer stations
  - 5 landfills (7,070 TPD)
  - 1 wind farm
- Overall WTE and landfill revenues \$81 million in 2009
- Targeted growth of 2 new plants mostly DBOT projects annually through 2020 with an expected capacity of 35,800 TPD



### SEG Assets:

- WTE plant operational
- WTE plant under construction and plan
- Transfer
- Landfill / Gas-to-Energy
- Wind farm

# China Project Development Cycle and Economics





# Growth Opportunities – UK/Europe (1/2)

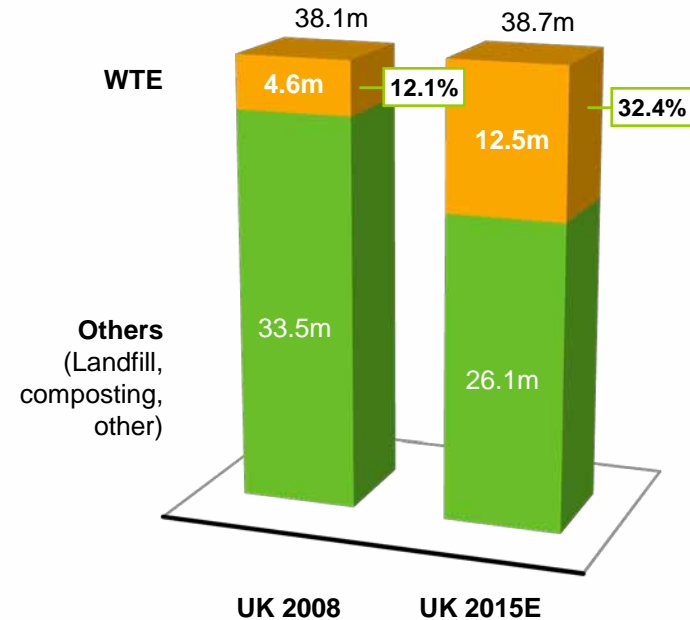
## European drivers:

- Revised EU Directive on Waste – Favors energy recovery over disposal
- EU Directive on Landfill of Waste: By 2016 biodegradable municipal waste (BMW) land-filled must be 35% of the quantity land-filled in 1995

## UK implementation:

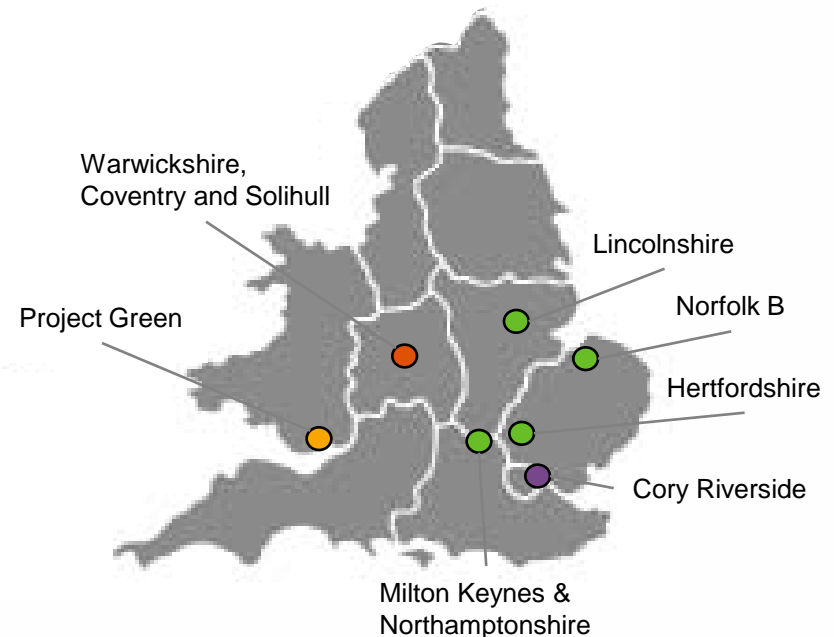
- Landfill tax of £ 48/ton in the UK which will rise to £ 72/ton in 2013
- Authorities that landfill more BMW than the allowances they hold, to be liable to a penalty of £ 150 for each ton over the limit after 2010
- UK government has provided £ 2.5 billion in Public Finance Initiative (PFI) funding between 2008 – 2011 for new projects

Incinerated Volume as % of Total MSW  
(in tons)



# Growth Opportunities – UK/Europe (2/2)

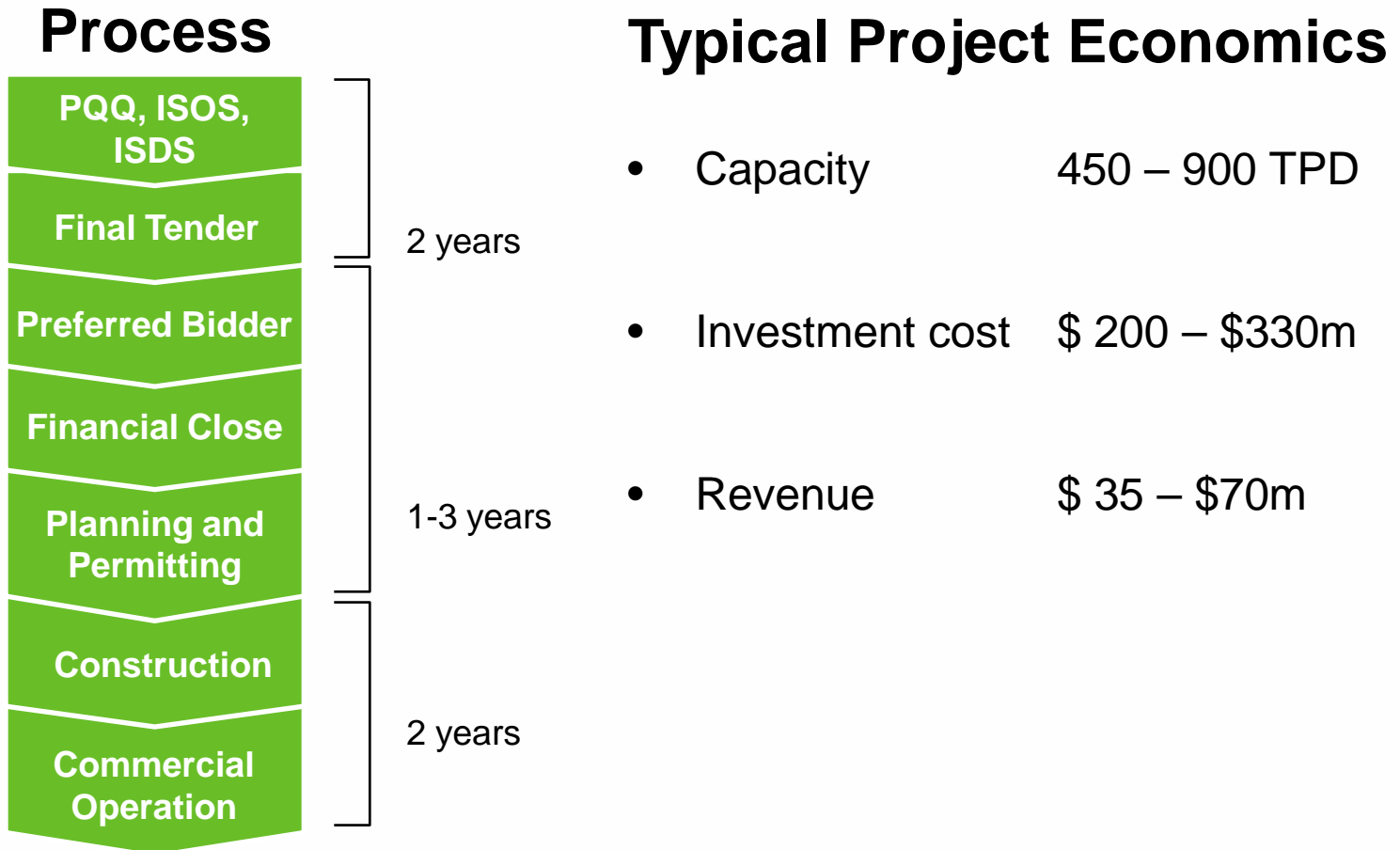
- Currently pursuing 6 DBOT/DBO WTE projects (3,350 TPD) with local waste companies Shanks Group and Cory Environmental
- Targeted growth of 1 project per year, 1 acquisition in the next 1-2 years and further extension of the O&M service line of business
- Also focused on Germany and the Netherlands (e.g. for acquisition of utility divestitures and operation services) and emerging markets like Poland (e.g. for new builds)
- Conducted operations support program at the AEB, Amsterdam WTE facility (4,600 TPD) in 2009



## PFI Procurement Stages

- PQQ
- ISOS
- ISDS
- Operating Support

# UK Project Development Cycle and Economics



# Investment Requirements for WTE

	USA	China	UK
<b>Expected projects per year</b>	1-2	2-3	1
<b>Typical contract structure</b>	Design, Build, Operate (DBO)	Design, Build, Operate, Transfer (DBOT)	Design, Build, Operate, Transfer (DBOT)
<b>Typical investment structure</b>	Investment from public customer only	SEG (private party) will cover the investment	WTI and their UK partners (private parties) will split the investment
<b>Investment requirements per project</b>	N/A	<p>~ \$ 75 – 90 million</p> <ul style="list-style-type: none"> <li>• Primarily financed from SEG cash flow</li> </ul>	<p>~ \$ 200 – 330 million</p> <ul style="list-style-type: none"> <li>• Start of investment not before 2012</li> <li>• 50% will be covered by partner</li> </ul>



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# Introduction

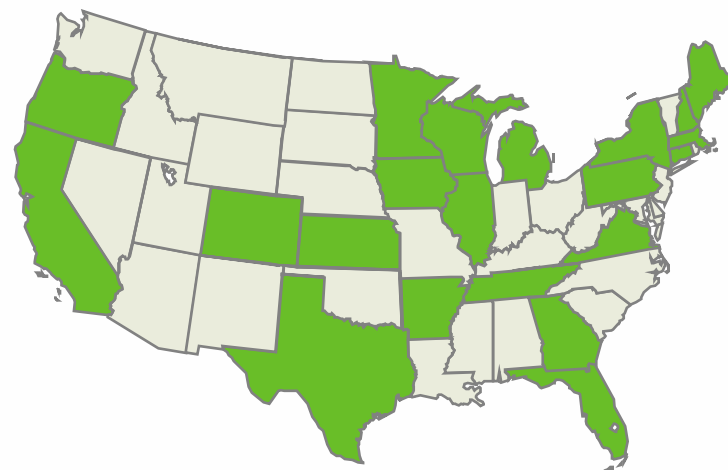
- Organic material in a landfill undergoes a natural process called anaerobic digestion to produce landfill gas. The gas is comprised of 50% - 60% methane, the same component as natural gas
- The landfill gas is collected in a series of wells and pipes and delivered to a central point for incineration in a flare or for beneficial use
- The flow of gas increases as additional waste is placed in the landfill, and begins to decrease when the landfill is closed
- The gas can be used for any application that natural gas is typically used for, including:
  - Fuel in turbine or engine power plants to generate electricity
  - Fuel in industrial applications for heat or steam production
  - Processing into pipeline quality natural gas and delivered to a commercial pipeline
  - On-site landfill liquid waste evaporation
  - Conversion into liquefied natural gas

# Project Inventory

- WM has a total of 119 landfills utilizing the landfill gas for beneficial use
- The landfill gas used at these projects is equal to over 2 million tons of coal per year, and equivalent to 540 MW, which could generate enough electricity to power over 400,000 homes per year
- Of the 119 projects, WM owns 61 facilities: 51 power plants, 5 direct sales to industrial users, 4 on-site liquid disposal facilities, and 1 landfill-gas-to-LNG plant
- The remaining facilities are owned by third party developers, who purchase the gas from WM
- WM has now internalized all development, with a focus on owning and operating renewable energy power plants

# Existing Power Business

- WM's internal ownership and operation of landfill-gas-to-energy plants is unique in the waste industry
- The 51 power plants owned by WM are located in 21 states
- Electric capacity of WM owned sites is 262 MW, generating 1.9 million MWh per year
- WM manages the business development and operations through a corporate business unit, WM Renewable Energy (WMRE)
- WM is now pursuing additional projects on third party landfills to expand the growth opportunity of this business

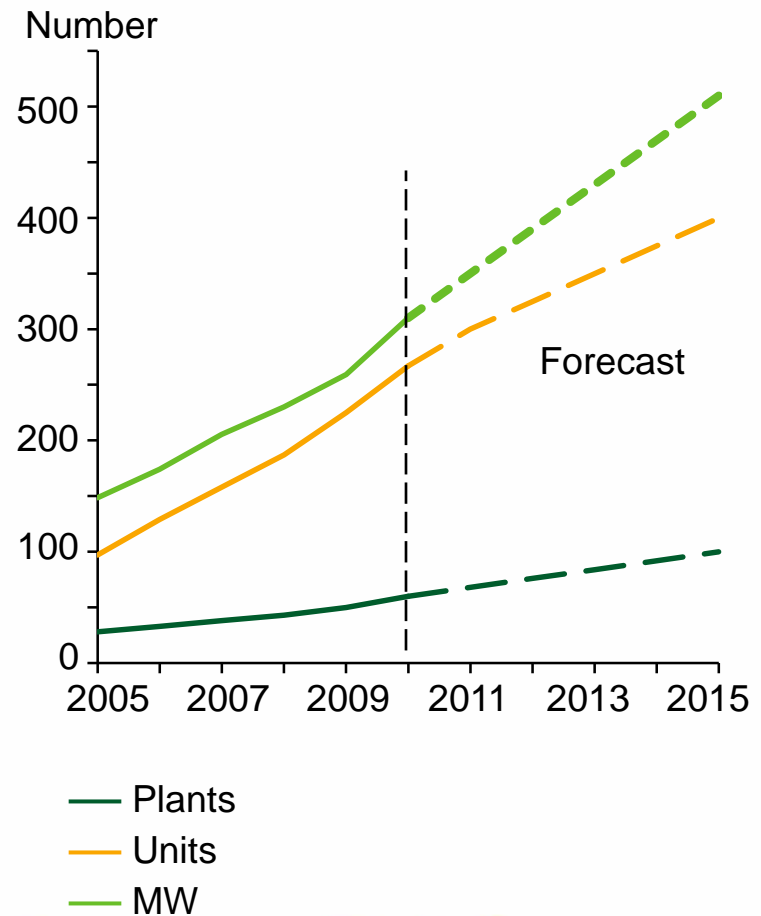


■ States with WM owned  
Landfill-Gas-to-Energy assets



# Growth Opportunities

- WM plans to triple the power output from Landfill-Gas-to-Energy by 2015 compared to 2005
- From 2010 to 2015 WM plans to add 8 new projects to its portfolio annually (average capacity of 5 MW)
- Growth opportunities also include expansions at existing projects where the landfill gas flow continues to increase

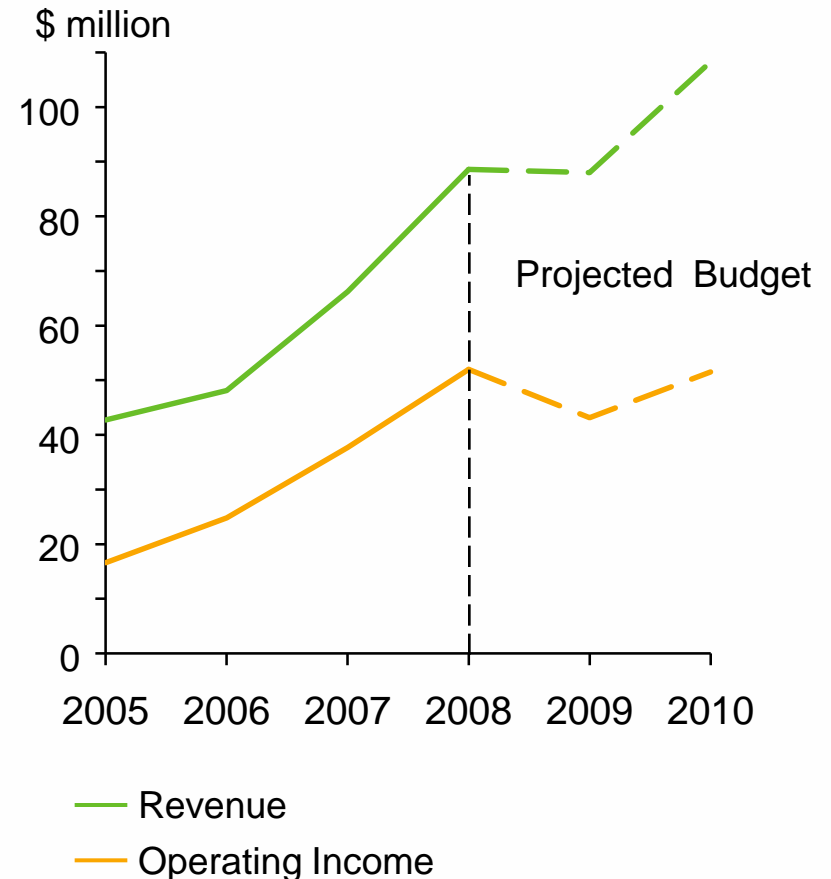


# Project Development

- Plant size depends on the quantity of gas from the landfill. Typical plant size is 5 MW, but may range from 1.5 MW to over 10 MW. It is common to expand plants every 3 to 8 years by adding additional engines as the gas flow increases
- The plant capital cost may range from \$3 million to over \$10 million per plant, with an average cost of \$1.2 to \$1.8 million per MW
- Project development time frame ranges from 1 to 3 years, depending on permitting, utility interconnect, energy marketing, and coordination with landfill permitting and operations
- Energy prices and renewable energy credits vary with location. Current development priority is long-term contracts from utilities complying with renewable portfolio standards, or municipal utilities and power cooperatives interested in increasing renewable resources

# Economics

- Landfill-Gas-to-Energy revenues more than doubled from \$42.7 million in 2005 to \$88.6 million in 2008
- The Landfill-Gas-to-Energy power plants realized an operating margin of 49% in 2009
- Projects proposed for construction in 2010 have IRR's ranging from 14% to 30%
- Landfill-Gas-to-Energy projects earn renewable energy credits between \$3 and \$30/MWh depending on the state
- Federal tax credits of \$11/MWh are granted for 10 years

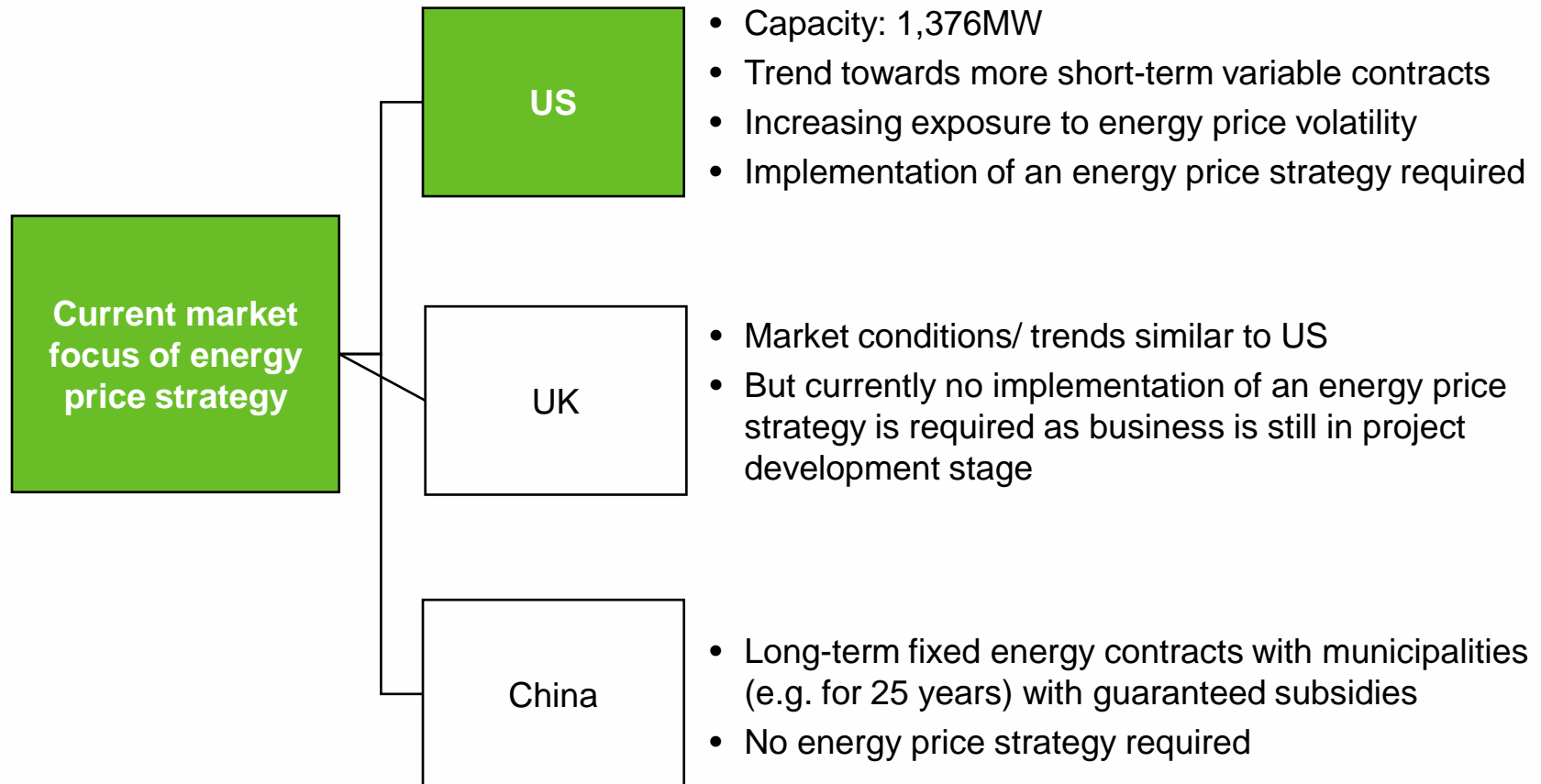


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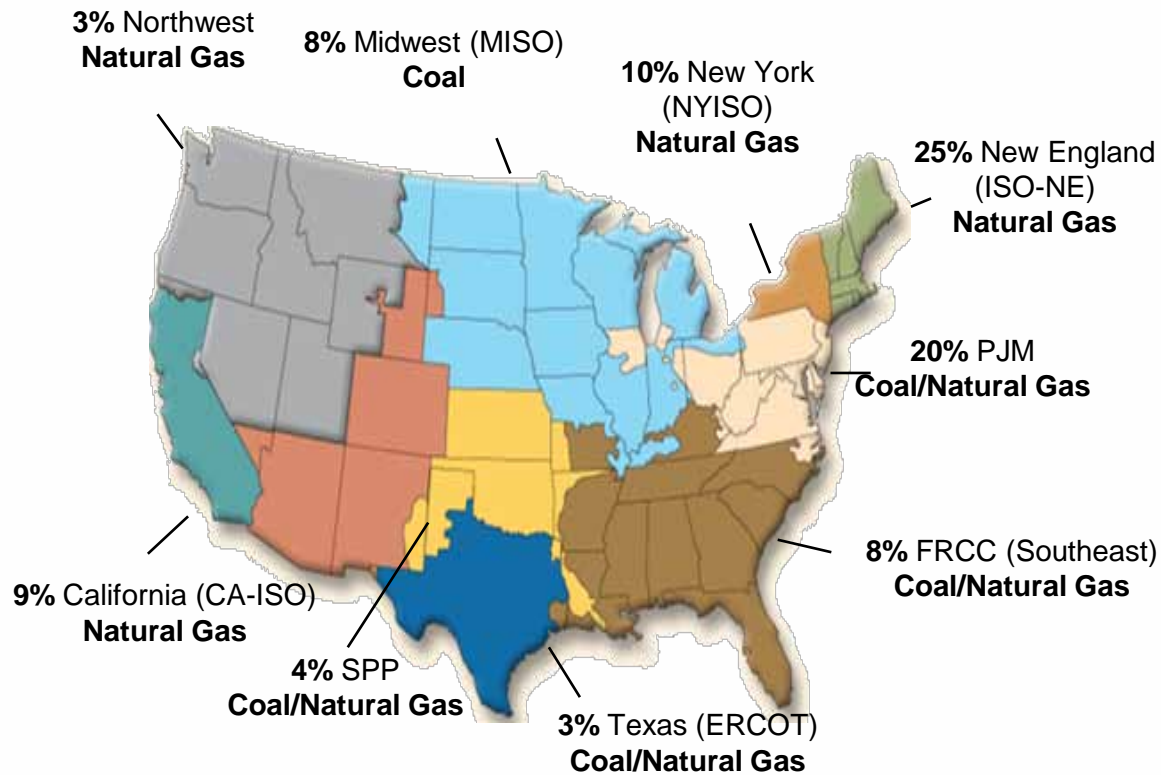
# Scope of WM's Energy Price Strategy





# Regional WM Market Mix

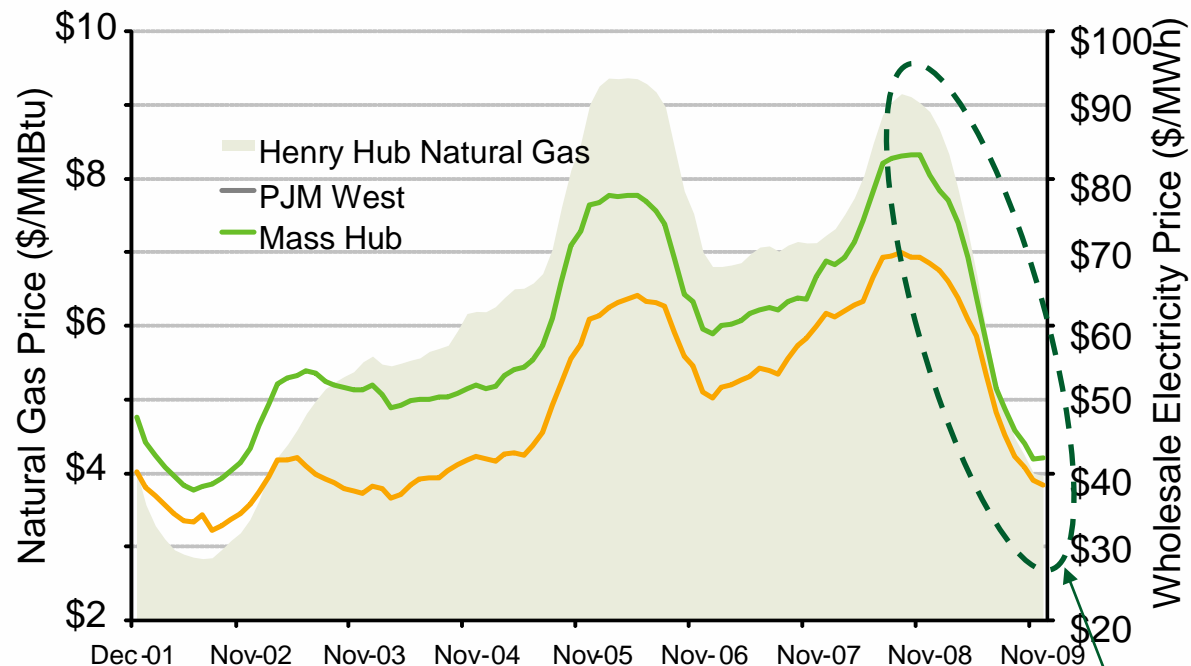
## Distribution of WM's MWh across US energy markets



The WM energy portfolio is spread around various regional electricity power markets in the US, where power prices are primarily set by **natural gas prices**

# Energy Price Sensitivity and Volatility

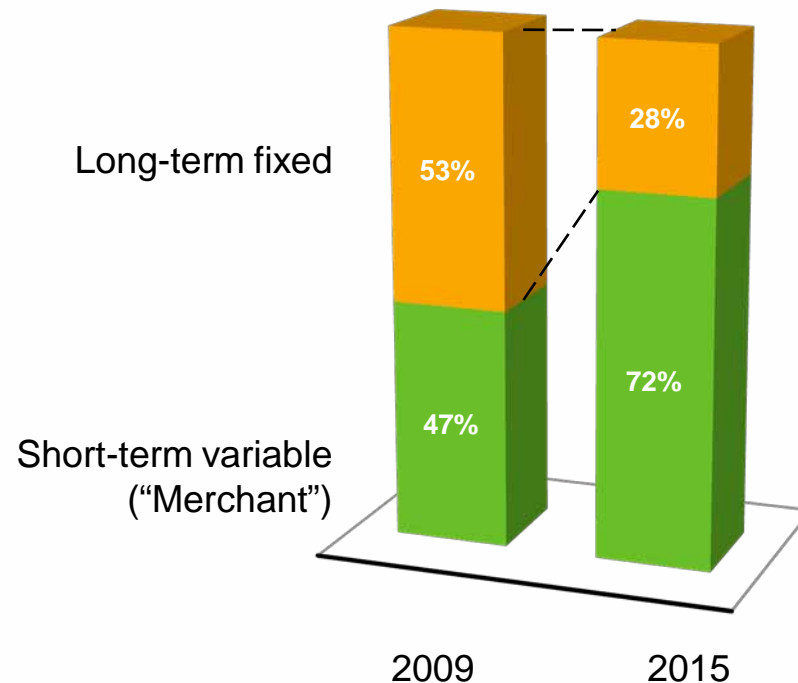
- Electricity prices in WM markets follow movements of natural gas prices
- Historic average volatility of natural gas prices over past 9 years has been 30%
- In 2009, price volatility reached over 50%



**Today:  
55%  
Volatility**

# WM Contract Structure (MWh)

- 47% of WM's energy output was exposed to price volatility on energy markets in 2009
- Revenue exposure to market price risk will further increase as the WM short-term variable contract share is expected to grow to about 72% by 2015



# Energy Management Program

**From**

Energy management strategy by business line for the “merchant” portion of the output allowing price to be set by spot markets



**To (starting 2010)**

Companywide consolidated energy management strategy for the “merchant” portion of the output

Revenue volatility in excess of 50% across short-term variable portions of the contract mix

Less revenue fluctuation through hedging

# Hedging Strategies

CONCEPTUAL

## Contract Duration

	1-year	2-year	3-year	
Current energy price above historic trend line	Lock less than 25%	Lock 25% - 50%	Lock 50% - 75%	Reduce market volatility and exploit LT upside
Current energy price below historic trend line	Lock 50% - 75%	Lock 25% - 50%	Lock less than 25%	Reduce market volatility and minimize ST downside



