



Overview of Reference Case

*State of Wisconsin
Department of Natural Resources and the
Governor's Global Warming Task Force*

April 17, 2008

Agenda:

1. Inputs & Assumptions
2. Power Sector
3. Energy Prices
4. GHG Emissions

Inputs & Assumptions

Economic Data

Inputs & Assumptions: Outputs

- ENERGY 2020 outputs include data for 70 economic sectors and other categories. The data has been consolidated by sector, based on the following sectors as agreed to with the TAG:
 - Residential
 - Commercial
 - Pulp and Paper
 - Other Energy Intensive Industries (*these include Smelting and Refining, Iron and Steel, Chemicals, Cement, Petroleum Refining, & mining*)
 - Other Industry (including construction)
 - Passenger Transportation
 - Freight Transportation (including off-road)
 - Agricultural
 - Forestry
 - Waste and Wastewater
 - Power Sector

Inputs & Assumptions: Economic Data

- The initial economic forecast was provided by Wisconsin DOT from the REMI model.
- REMI and ENERGY 2020 were re-run to calculate a new Reference Case including the Energy Independence and Security Act and the high energy price scenario
- REMI forecast accepted as reasonable however TAG viewed growth in some sectors as optimistic.

Base Case:	2005	2010	2015	2020	2024
Employment (thousands)	3,532	3,673	3,729	3,830	3,900
Gross State Product (Billions 2000 \$)	201	234	273	314	347
Real Personal Disposable Income (Billions 2000 \$)	149	164	177	193	206

Employment by Sector (thousands)	2005	2010	2015	2020	2024
Paper	39	37	35	37	39
Other Energy Intensive Industry	74	70	65	68	69
Other Industry	633	725	698	719	728
Commercial	2,231	2,388	2,462	2,536	2,590

Power Sector

Electricity Sales and Generation

Electricity Sales (GWh)						
Sector	2004	2006	2010	2015	2020	2024
Residential	19,203	20,148	21,805	23,086	25,063	26,806
Commercial	21,800	22,272	23,722	26,371	29,592	32,333
Industrial	28,438	31,226	33,137	35,625	41,716	46,133
Street Lights/Misc.	400	400	400	400	400	400
Resale	20	-	-	-	-	-
Total Sales	69,861	74,046	79,064	85,482	96,771	105,672
Net Imports to Region	9,416	12,402	(1,140)	3,866	12,720	16,169

Generation Output (GWh/year)						
Plant Type	2004	2006	2010	2015	2020	2024
Gas/Oil	3,146	6,226	10,509	9,431	9,967	13,776
Coal	42,141	40,043	54,909	54,020	54,226	54,226
Nuclear	11,888	12,234	12,115	12,802	12,802	12,802
Hydro	1,981	1,679	1,184	1,184	1,184	1,184
Landfill Gas/EFW	114	110	133	419	944	1,283
Wind	1,175	1,349	1,283	3,374	4,014	4,967
Other	-	4	72	386	913	1,265
Total	60,445	61,644	80,204	81,616	84,051	89,503

Electricity Capacity and Peak

Generation Capacity (MW)						
Plant Type	2004	2006	2010	2015	2020	2024
Gas/Oil Combustn. Turbine	5,248	6,793	4,517	4,517	4,517	4,517
Gas/Oil Combined Cycle			2,679	2,680	2,881	4,482
Gas/Oil Steam			360	383	383	383
Coal	6,882	6,984	8,560	8,441	8,441	8,441
Nuclear	1,583	1,586	1,586	1,676	1,676	1,676
Hydro	447	447	447	447	447	447
Landfill Gas/EFW	60	52	52	88	154	197
Wind	39	121	484	1,166	1,363	1,653
Other	-	-	12	63	149	206
Total	14,259	15,983	18,697	19,460	20,011	22,001

Note – EFW = Energy from Waste; Other is primarily renewable generation.

Peak Loads (MW)	2004	2006	2010	2015	2020	2024
Annual Peak Load	12,958	13,616	14,483	15,666	17,653	19,234
Reserve Margin Calculation						
Adjusted Peak Load (<i>net of Demand Reduction and Interruptible Load</i>)	12,103	12,761	13,628	14,811	16,798	18,379
Adjusted Generation Capacity (<i>Including out-of-state generation devoted to WI & 15% of wind capacity</i>)	15,062	16,716	19,122	19,305	19,689	21,432
Estimated Reserve Margin -	23%	29%	38%	29%	16%	16%

Note - The model does not attempt to reflect annual variations in peak demand due to weather variations or other factors. These variations in the peak load are not expected to have a material impact on GHG emissions from the power sector.

Peak Loads and In-State Renewable Sales

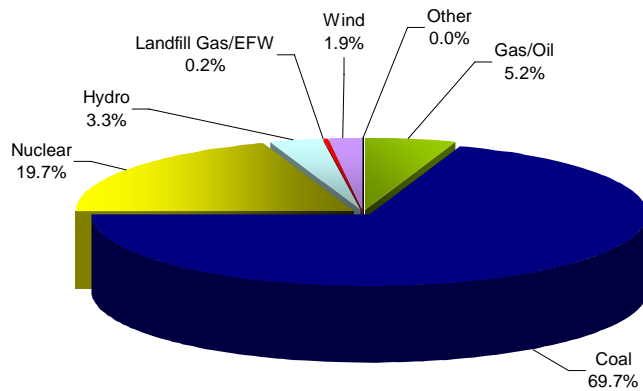
Renewable Generation as a Percentage of Total Sales:	2015	2020	2024
Target	10%	10%	10%
Model Results	4.9	6.1	7.1
* Renewables defined as wind, solar, EFW, LFG and biomass.			

Note – The model results represent in-state generation only. Approximately half of the generation to meet the RPS is expected to come from outside of Wisconsin.

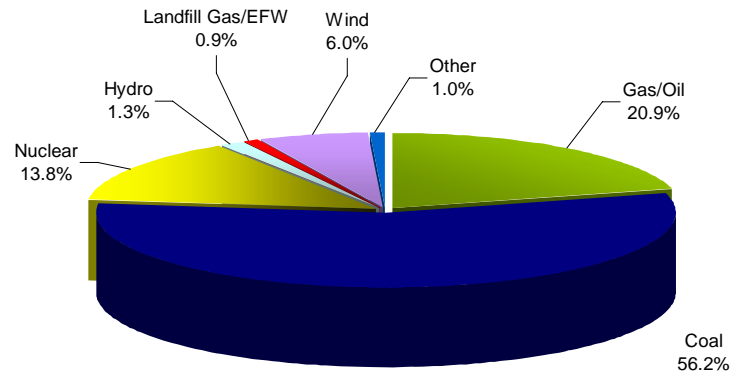
- RPS provisions is met by wind, energy-from-waste, landfill gas and biomass by 2010; with the majority of the new supply from wind.
- Some solar is added in the latter part of the period.
- Approximately half of the renewable generation required to meet the target of 10% of sales is assumed to be developed out-of-state.

Electricity Sales

Generation by Type - 2004
Share of Generation (GWh) Output



Generation by Type - 2024
Share of Generation (GWh) Output



Transportation

Transportation

Marginal Vehicle Efficiency (miles/gallon)						
	2004	2006	2010	2015	2020	2024
Light Gas Vehicles	30.9	32.1	33.7	36.9	41.9	45.4
Medium Vehicles	26.8	28.2	30.0	33.0	37.7	41.0
Heavy Vehicles	20.7	21.1	21.6	23.3	25.2	25.9
Heavy Diesel	20.7	21.2	21.8	23.6	25.5	26.3
	2004	2006	2010	2015	2020	2024
Ethanol as a % of Gasoline Used for Passenger Transportation*	2.8%	2.8%	4.2%	6.5%	9.0%	10.7%

**This represents total statewide use of ethanol.*

- Initial levels of VMT use for passenger transportation are below reported actual values however growth rates are higher than projected by the DOT.
- Initial levels of freight VMT are higher than DOT expectations but growth rates are lower than the DOT forecast.
- The efficiency of new vehicles rises by approximately 19% as a result of the requirements of the Energy Act.

Energy Prices

Energy Prices

Energy Prices (2007 \$'s)		2004	2006	2010	2015	2020	2024
Electricity							
	Units						
Residential	MWh	\$76.34	\$84.10	\$80.81	\$76.45	\$77.70	\$79.25
Commercial	MWh	\$68.33	\$70.05	\$67.09	\$63.25	\$64.63	\$66.19
Industrial	MWh	\$57.00	\$57.68	\$54.90	\$51.52	\$53.45	\$55.17
Average Retail	MWh	\$68.33	\$70.05	\$67.09	\$63.25	\$64.63	\$66.19
Natural Gas							
Residential	Mcf	\$13.44	\$16.63	\$16.73	\$15.50	\$15.84	\$15.84
Commercial	Mcf	\$11.91	\$14.85	\$14.21	\$14.21	\$14.21	\$14.21
Industrial	Mcf	\$11.08	\$12.83	\$13.33	\$13.33	\$13.33	\$13.33
Transportation Fuels							
Gasoline	gallons	\$2.34	\$3.29	\$3.29	\$3.55	\$3.74	\$3.83
Diesel	gallons	\$2.37	\$3.55	\$3.56	\$3.84	\$4.06	\$4.16
Biomass							
Residential	MBtu	\$5.20	\$11.53	\$11.50	\$13.53	\$15.10	\$15.84
Commercial	MBtu	\$3.76	\$10.09	\$10.06	\$12.09	\$13.66	\$14.40
Industrial	MBtu	\$3.76	\$10.09	\$10.06	\$12.09	\$13.66	\$14.40
Coal							
Industrial	MBtu	\$2.68	\$3.27	\$3.33	\$3.28	\$3.30	\$3.35
Power	MBtu	\$1.68	\$2.03	\$2.07	\$2.02	\$2.04	\$2.09

GHG Emissions

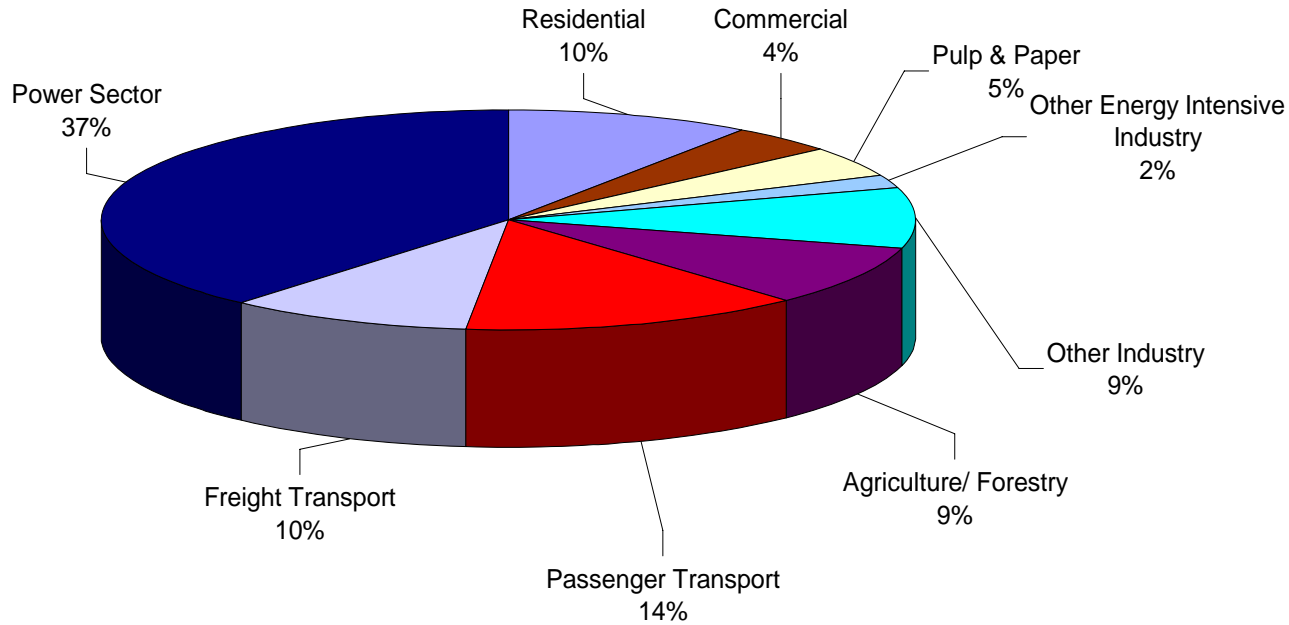
GHG Emissions:

GHG Emissions (Mt)	2004	2006	2010	2015	2020	2024	Average Annual % Change
Residential	13.1	12.9	13.2	13.3	13.6	13.9	0.3%
Commercial	5.9	5.6	5.2	4.7	4.5	4.5	-1.3%
Pulp & Paper	5.6	5.8	5.6	5.4	6.0	6.5	0.7%
Other Energy Intensive Industry	2.3	2.4	2.4	2.4	2.6	2.8	0.8%
Other Industry	8.9	9.4	9.7	10.3	11.6	12.6	1.7%
Agriculture	11.9	12.2	12.9	13.7	15.0	16.1	1.5%
Passenger Transport	21.6	21.4	21.8	20.9	20.1	20.1	-0.4%
Freight Transport	13.1	12.7	12.4	12.7	13.5	14.3	0.5%
Power Sector	45.6	49.9	59.3	57.4	57.9	59.3	1.3%
Waste & Wastewater	3.2	3.5	3.9	4.6	5.3	5.9	3.0%
Total Gross Emissions	131.3	135.8	146.2	145.3	150.1	156.1	0.9%
Land Use - Forestry	(8.2)	(8.2)	(8.2)	(8.2)	(8.2)	(8.2)	0.0%
Total Net Emissions	123.1	127.6	138.0	137.1	141.9	147.9	0.9%

- Level of sequestration due to land use changes based report by Winrock International.
- WRI inventory showed 2003 emissions of 123 Mt.
- Emissions from model results, excluding estimated sinks, equals 130 Mt in 2004.

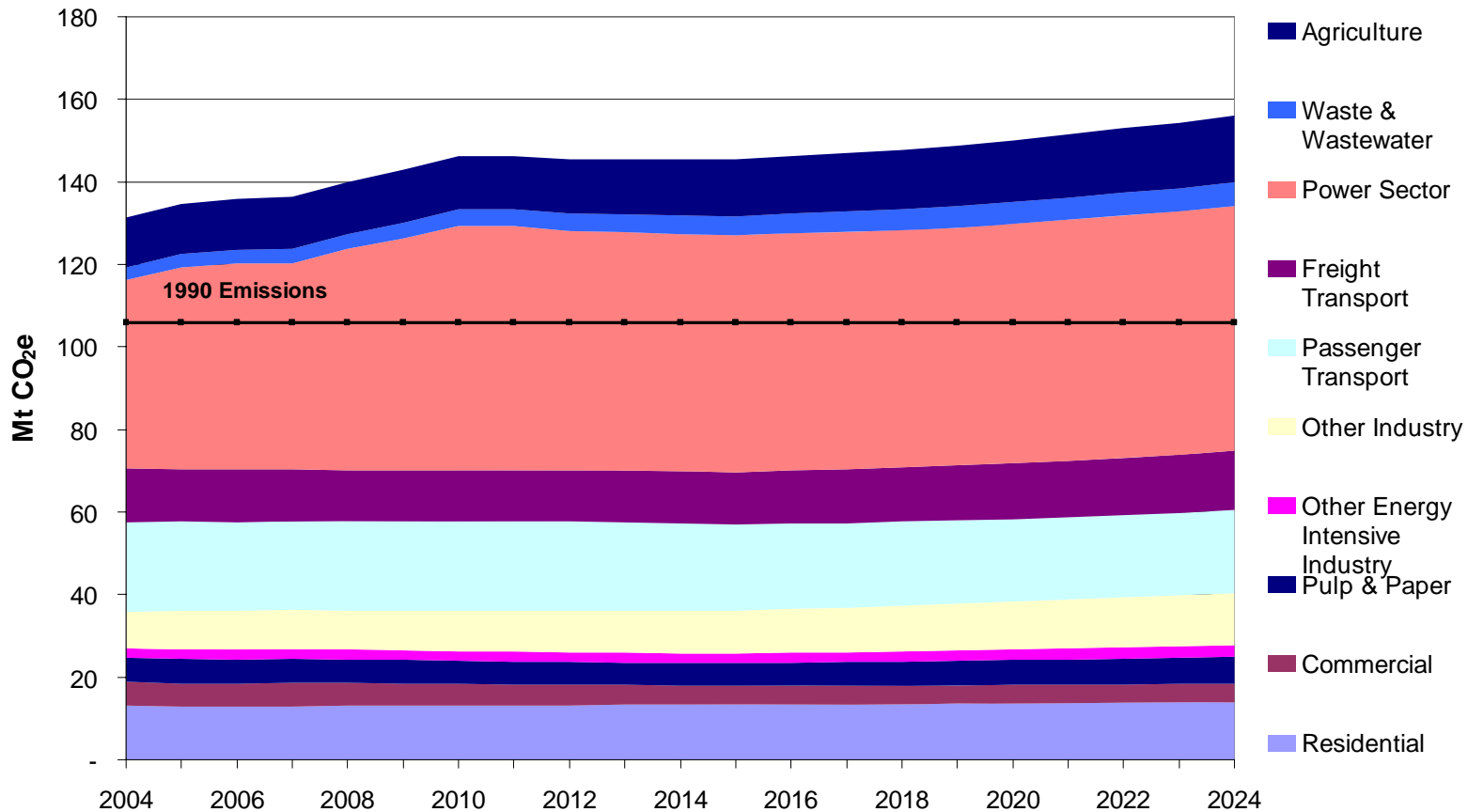
Greenhouse Gas Emissions

GHG Reference Case Emissions 2024



GHG Emissions

GHG Emissions - Reference Case



NOTE – Graph shows gross emissions without sequestration (8.2 Mt/year)

Questions?

Contact Information:

Glen Wood
ICF International
gwood@icfi.com
Phone: (416) 341-8952
Cell: (905) 86-3128