Overview of Reference Case

State of Wisconsin
Governor's Global Warming Task Force

January 4, 2008

Agenda:

1. Review of Inputs and Assumptions used
2. Power Sector results
3. Transportation Sector results
4. Total Fuel Use
5. GHG Emissions
6. Sensitivity Run
7. Next Steps – Federal Energy Act 2007

Inputs and Assumptions:

- “Reference Case Inputs & Assumptions” document presented to GWTF at December 20 meeting.
- Feedback from Task Force members reviewed by TAG and included in model and “Assumptions Book”
- TAG agreed to proceed with Reference Case based on the “high price scenario” developed by TAG

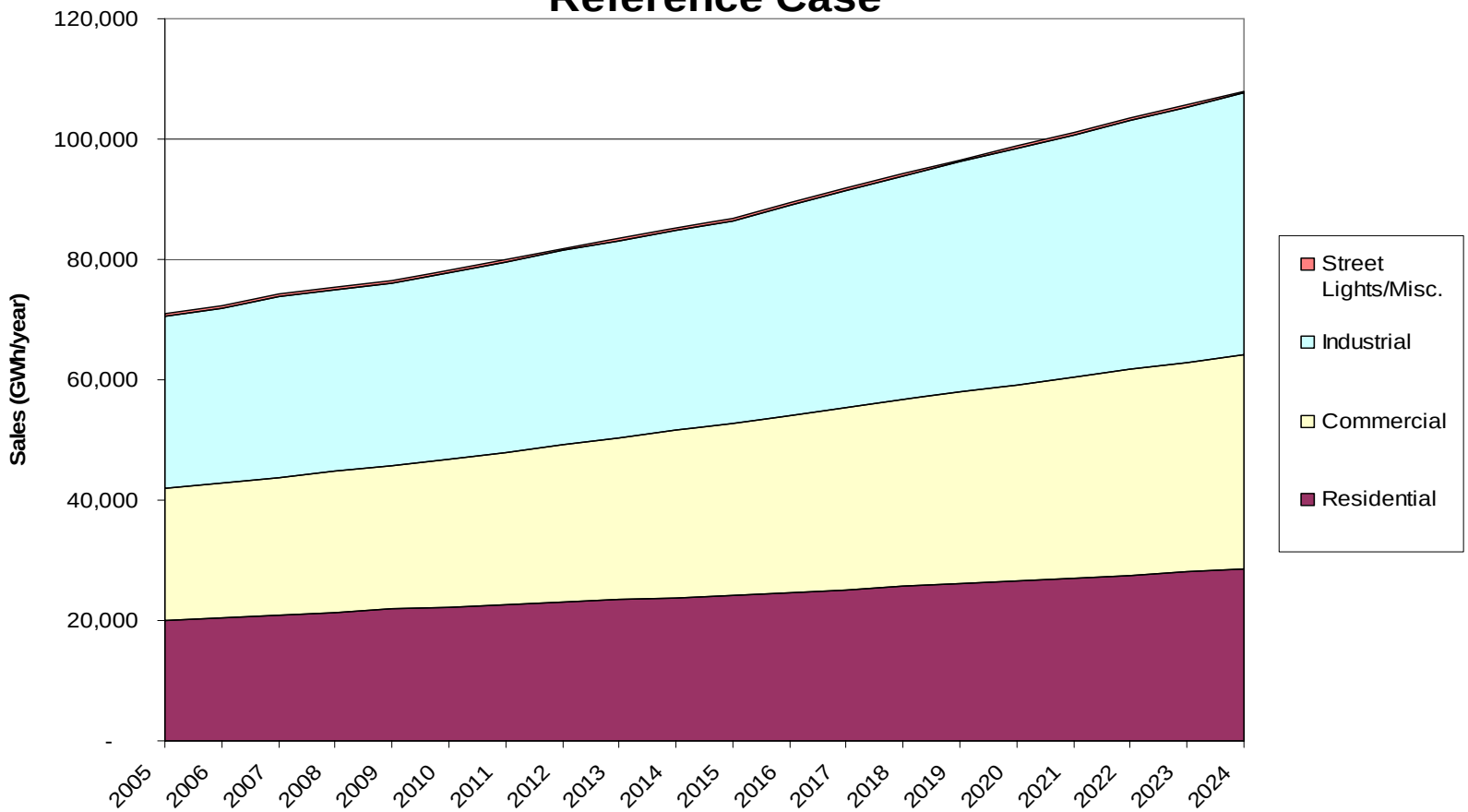
Inputs & Assumptions - Prices

- Oil prices from US EIA Annual Energy Outlook High Price Case
- Natural gas based on NYMEX futures price for 2008 held constant in real terms
- Coal price based on the AEO High Price Case
- Historic electricity prices from Energy Information Administration (EIA)
- Model calculates future power prices based on generation costs.

Power Sector

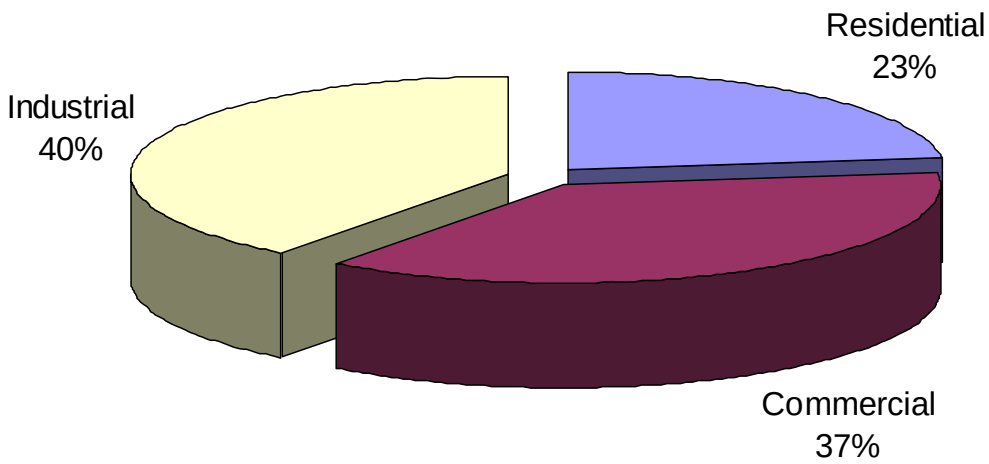
Electricity Sales - Wisconsin

Reference Case

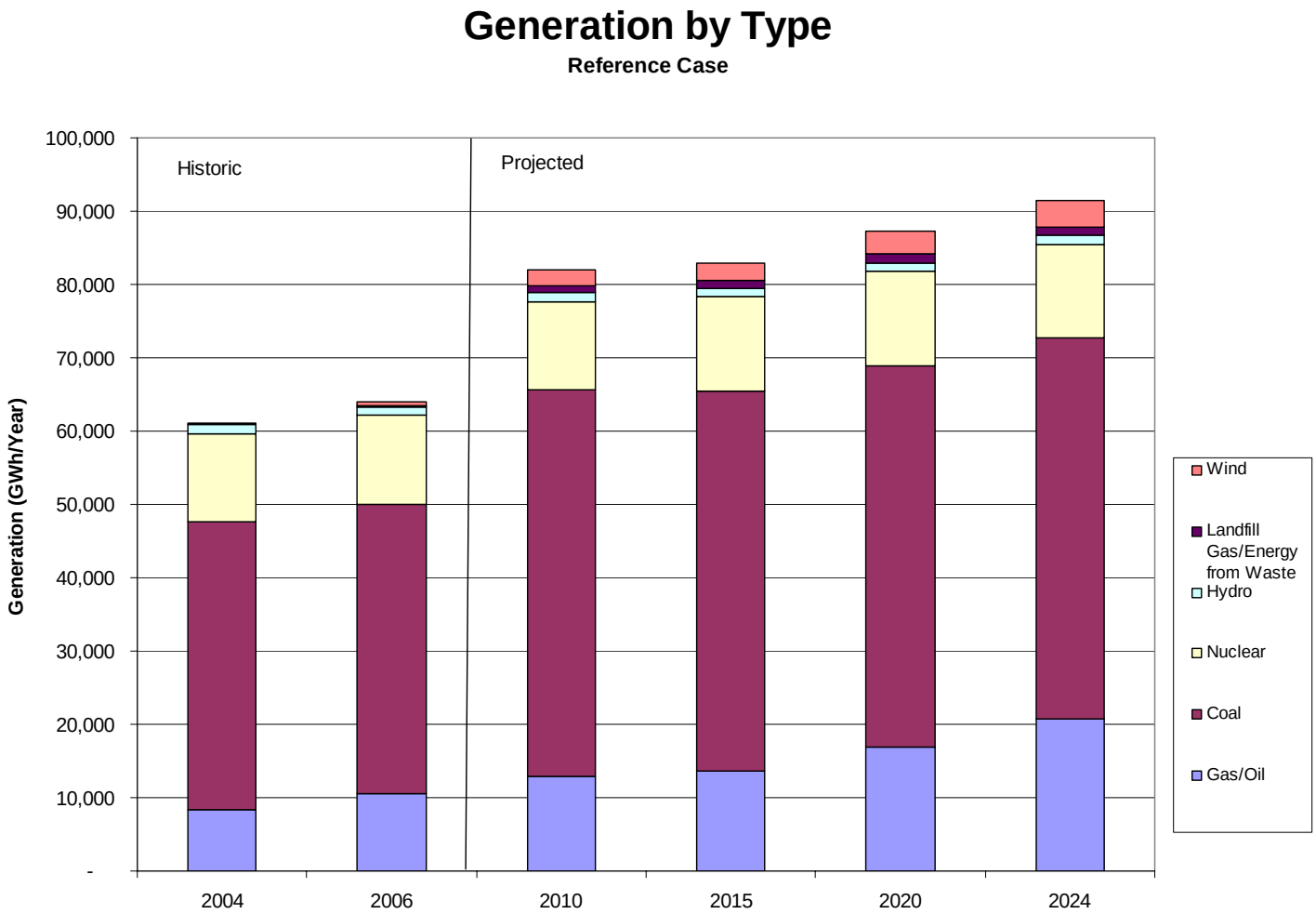


Electricity Sales

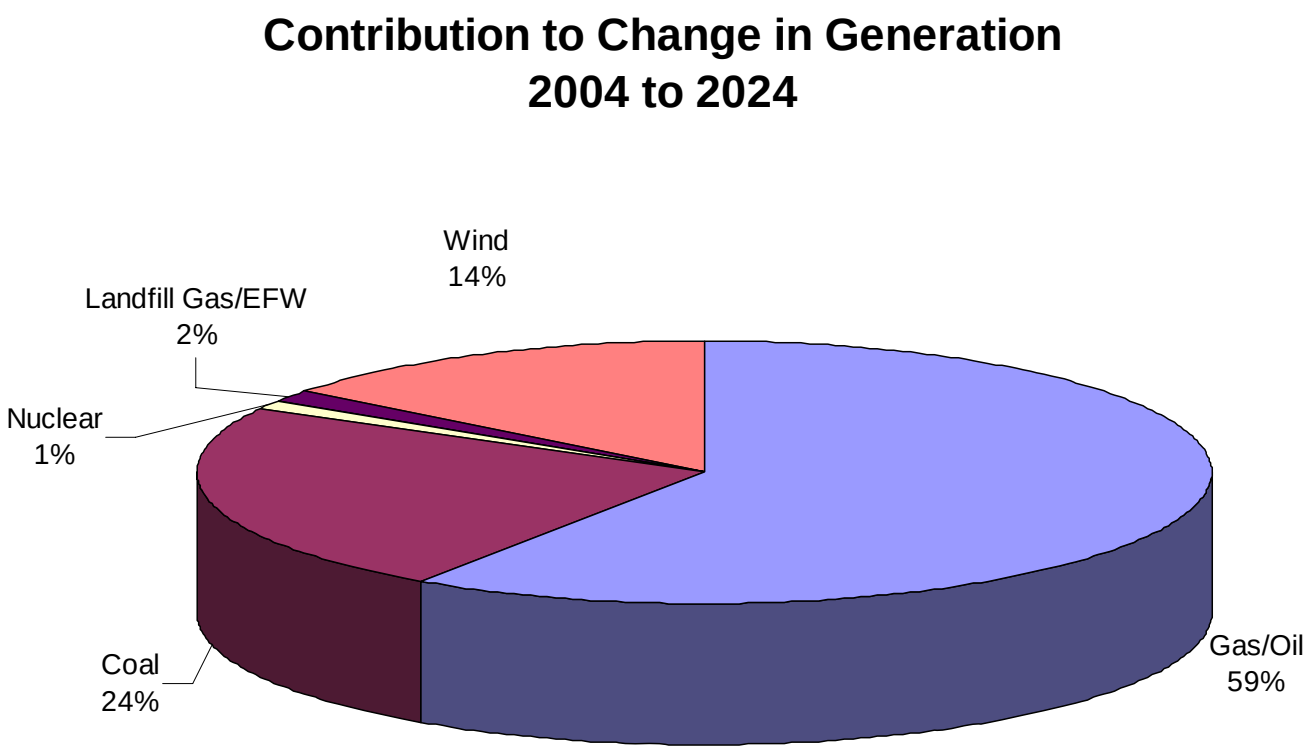
Contribution to Sales Growth
2004 to 2024



Electricity Generation

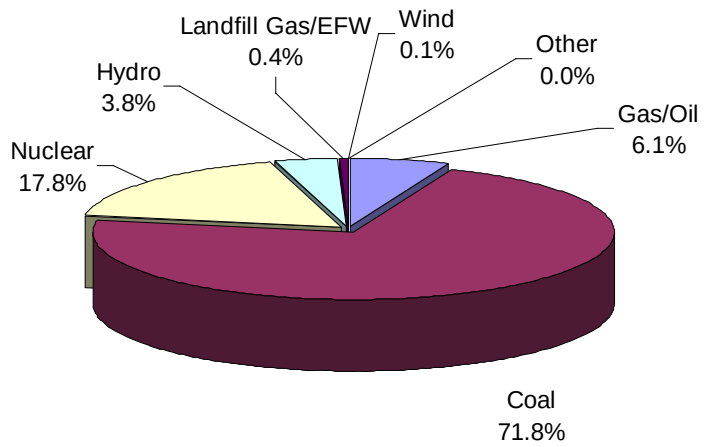


Electricity Generation



Electricity Generation by Source

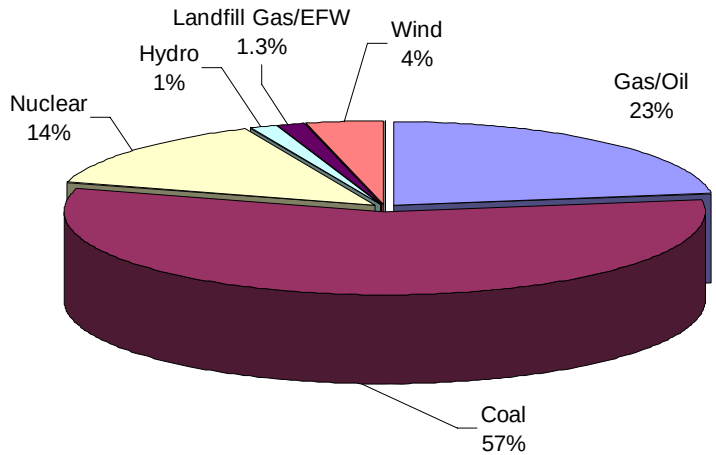
Generation by Type - 2004
Share of Generation (GWh) Output



- Nuclear and Coal contributions both decline as share of total
- Gas and Oil generation increases

- Landfill Gas, Energy from Waste, and Wind increase several-fold but still represent < 6% of total output.

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



Electricity Generation

Generation Output (GWh/year)						
Plant Type	**2004**	**2006**	**2010**	**2015**	**2020**	**2024**
Gas/Oil	8,274	10,554	12,956	13,575	16,977	20,733
Coal	39,302	39,473	52,650	51,968	51,968	51,968
Nuclear	12,115	12,115	12,115	12,802	12,802	12,802
Hydro	1,184	1,184	1,184	1,184	1,184	1,184
Landfill Gas/Energy from Waste	137	137	931	931	1,198	1,198
Wind	96	622	2,194	2,510	3,114	3,608
Other	-	-	-	-	-	-
Total	***61,107***	***64,085***	***82,030***	***82,970***	***87,243***	***91,493***

Generation Capacity (MW)						
Plant Type	**2004**	**2006**	**2010**	**2015**	**2020**	**2024**
Gas/Oil	3,874	6,538	8,123	8,246	9,006	9,406
Coal	6,899	6,887	9,226	9,106	9,106	9,106
Nuclear	1,586	1,586	1,586	1,676	1,676	1,676
Hydro	671	671	671	671	671	671
Landfill Gas/EFW	52	52	152	152	196	196
Wind	36	236	833	953	1,182	1,370
Other	-	-	-	-	-	-
Total	***13,118***	***15,969***	***20,590***	***20,804***	***21,837***	***22,424***

Power Sector Comparison:

For 2004	Model Results	WI Stats[1,2]	WI Stat Description
Total Generation Capacity (MW)	13,118	12,573 (a) 15,056 (b) 15,905 (c)	a) Owned generation used for Wisconsin loads, b) Total including owned & merchant c) electric power supply.
Total Generation Output (GWh)	61,107	57,987	Utility gen. inc. IPP, but excluding imports and losses.
Sales (GWh)	70,931	67,976	Sales to ultimate customers
Peak Load (MW)	13,103	13,001 - Peak 12,149 - Adjusted	Adjusted value is net of Interruptible and DR, capacity sales/purchases, etc..
For 2006	**Model Results**	**WI Stats[1,2]**	**WI Stat Description**
Total Generation Capacity (MW)	15,969	12,762 (a) 16,238 (b) 16,302 (c)	a) Owned generation used for Wisconsin loads, b) Total including owned & merchant c) electric power supply.
Total Generation Output (GWh)	64,085	58,822	Utility gen. inc. IPP, but excluding imports and losses.
Sales (GWh)	74,179	69,809	Sales to ultimate customers
Peak Load (MW)	13,693	15,166 – Peak 14,022 - Adjusted	Adjusted value is net of Interruptible and DR, capacity sales/purchases, etc..

- Modeled sales slightly above reported sales.
- Total generating capacity close to owned plus merchant generation
- Growth in peak demand in model matches PSC forecast
- Growth in energy sales slightly above PSC forecast (2.1%/yr. to 2024)
- Out of state generation devoted to WI needs, interruptible loads and DR addressed in reserve margin calculation for new generation requirements).

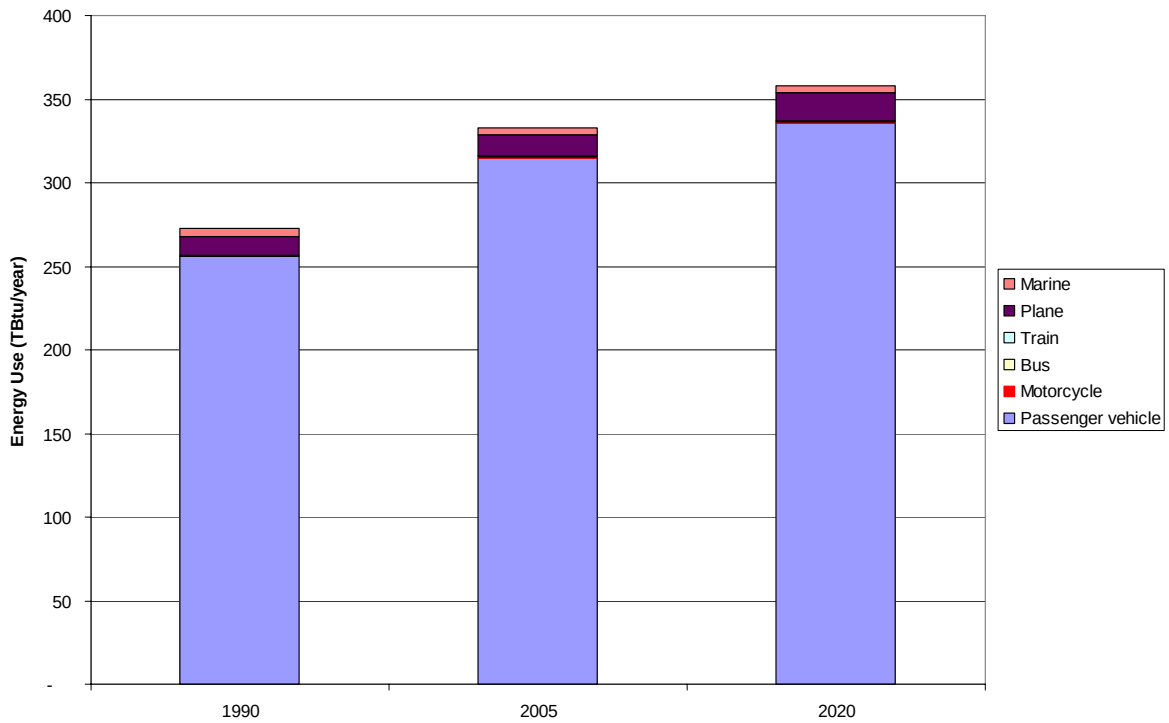
Transportation

Transportation Sector - Demand

- Growth in passenger transportation demand above Wisconsin DoT forecasts but from lower starting point
- Freight energy use grows more slowly than in DoT forecast but from higher starting point.
- Bulk of passenger energy use for personal vehicles

Distance Travelled *(millions of vehicle miles travelled)*	
	Avg. % Chg. per year
Passenger	2.05%
Freight	2.00%
Passenger Miles/person	1.35%

Passenger Transportation Energy Use



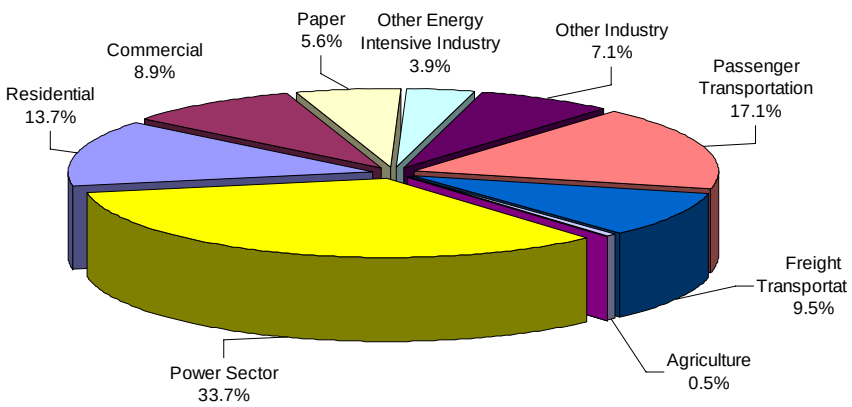
Transportation Sector

Vehicle Efficiency (miles/gallon)						
	2004	2006	2010	2015	2020	2024
Light Gas Vehicles	30.9	32.1	33.8	35.6	37.2	38.2
Medium Vehicles	26.8	28.2	30.0	31.9	33.5	34.5
Heavy Vehicles	20.7	21.1	21.6	22.1	22.4	22.6
Heavy Diesel	20.7	21.2	21.8	22.4	22.7	22.9
	2004	2006	2010	2015	2020	2024
Ethanol as a % of Gasoline Used for Passenger Transportation	2.7%	2.4%	2.8%	2.9%	2.9%	3.0%

- No major increase in vehicle efficiencies assumed in Reference Case but average fleet efficiency increases in response to rising prices.
- Levels of ethanol use match well with 2004 reported levels for Wisconsin – reflecting higher use in southwestern portions of state.

Total Fuel Use

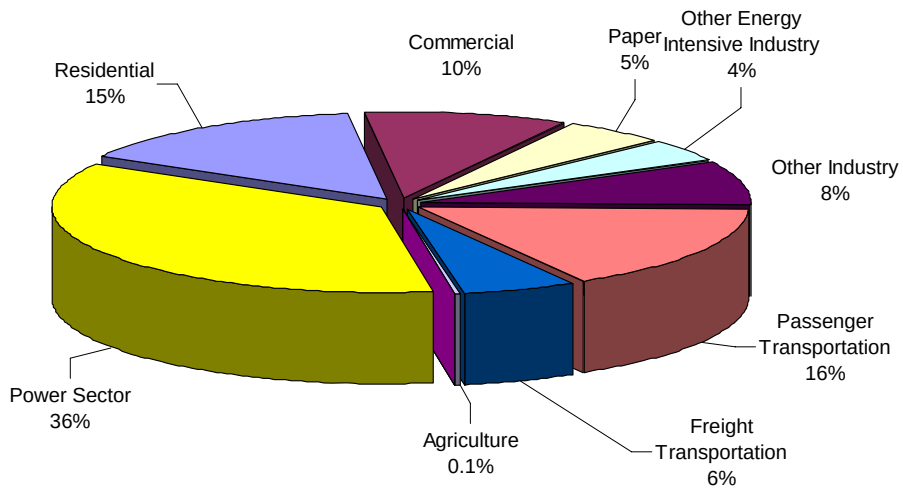
Energy Use by Sector - 2004



- Power sector accounts for over one-third of total energy use.
- Residential sector takes smaller share by 2024 while commercial grows.

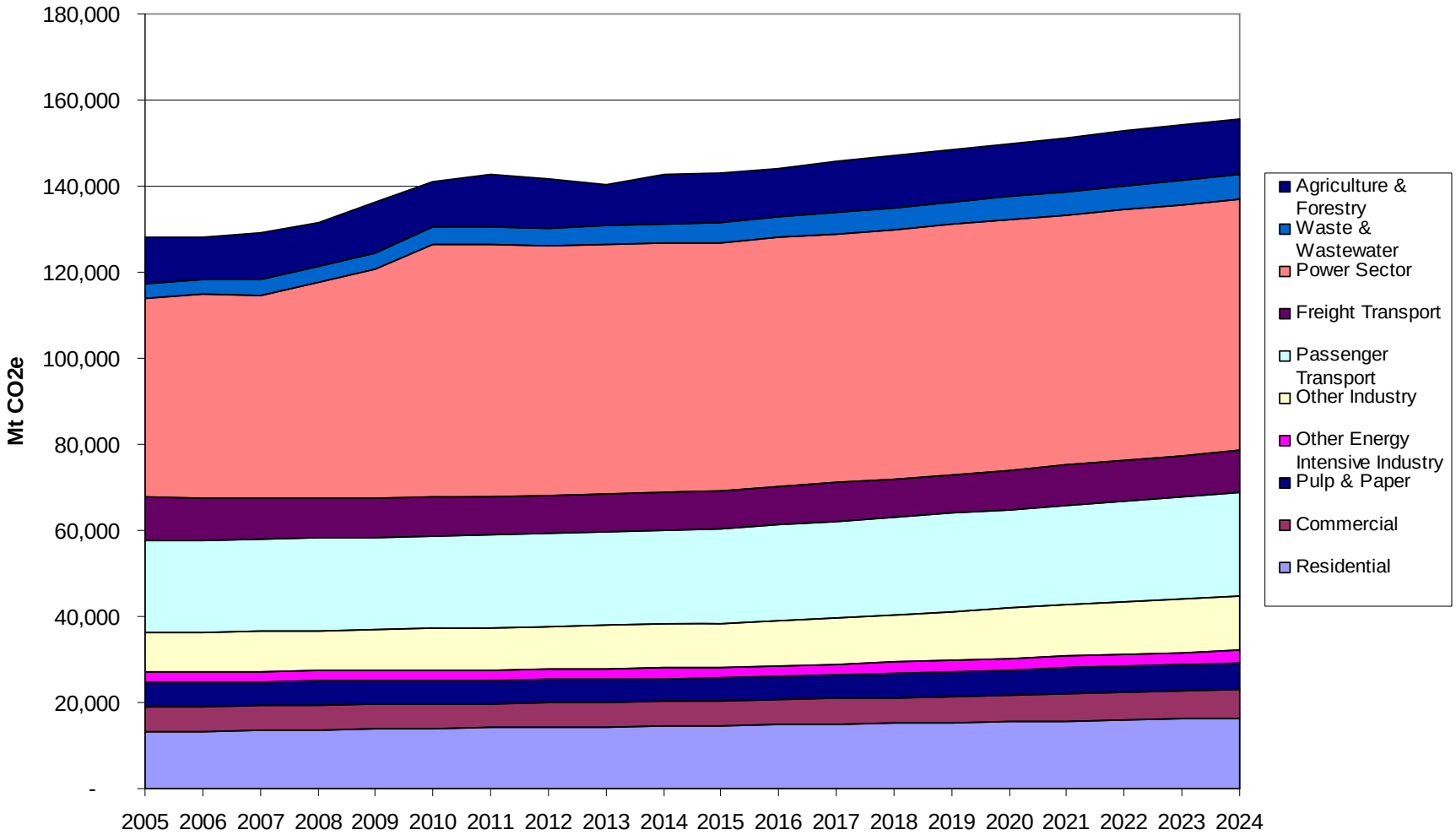
- Modest shift from energy intensive industries to other manufacturing over period.
- Transportation accounts for over 25% of total energy use but declines slightly by 2024.

Energy Use by Sector - 2024



GHG Emissions

GHG Emissions – Reference Case



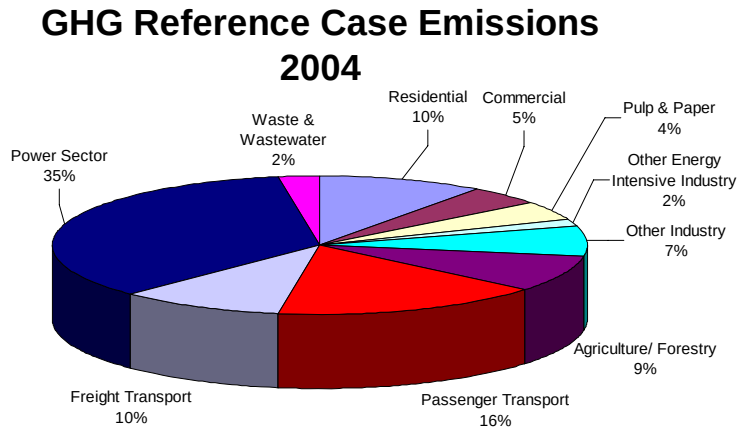
GHG Emissions:

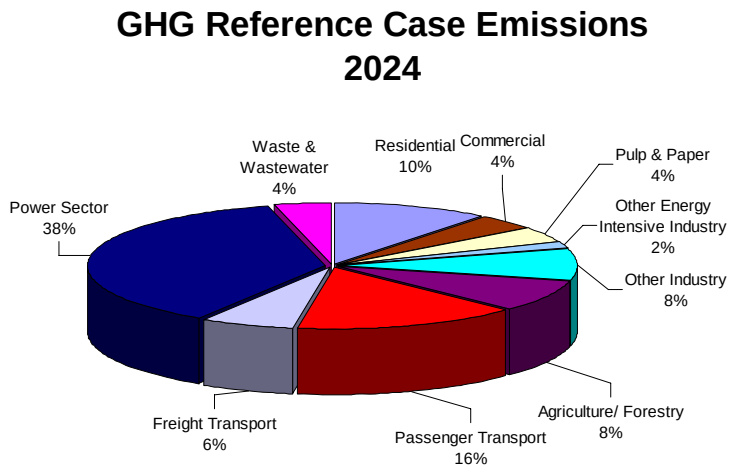
GHG Emissions (Mt)	2004	2006	2010	2015	2020	2024
Residential	13,073	13,301	14,034	14,626	15,516	16,340
Commercial	5,906	5,661	5,634	5,837	6,209	6,609
Pulp & Paper	5,630	5,666	5,420	5,217	5,838	6,357
Other Energy Intensive Industry	2,339	2,406	2,392	2,450	2,685	2,890
Other Industry	8,861	9,351	9,640	10,266	11,621	12,692
Agriculture/ Forestry	11,384	9,724	10,596	11,624	12,331	12,909
Passenger Transport	21,435	21,227	21,620	21,992	23,001	24,080
Freight Transport	13,080	9,702	8,938	8,812	9,169	9,640
Power Sector	45,572	47,469	58,842	57,746	58,169	58,312
Waste & Wastewater	3,209	3,576	3,943	4,609	5,320	5,886
Land Use - Forestry & Agric.	(9,500)	(9,500)	(9,500)	(9,500)	(9,500)	(9,500)
Total -	***120,990***	***118,582***	***131,560***	***133,678***	***140,360***	***146,214***

- Level of sequestration due to land use changes based on draft Winrock report (may be revised).
- WRI inventory showed 2003 emissions of 123 Mt. Model results, excluding estimated sinks, equal 128 Mt in 2006.

GHG Emissions in 2020

(not including sinks)





- Emissions increase in all sectors except freight
- Power sector largest sectoral contribution - grows as share of total as most of new generation fossil fuel based.
- Transportation accounts for about 25% of emissions – share declines by about 4%
- Residential, commercial and industrial sector's share of total essentially unchanged.

Low Price Scenario

- Reference Case was also run with lower energy prices (based on AEO forecast) providing sensitivity analysis.
- Some differences under lower prices:
  - Electricity sales growth slightly higher *(1% change by 2024)*
  - Modest increase in gas-fired generation in 2010 to 2020 period
  - Growth in transportation demand higher, particularly for freight *(difference of 0.3% annually for passenger; 0.4%/year for freight)*
  - Vehicle efficiency remains lower (34.5 vs 38.2 mpg)
  - Overall fuel use 2.3% higher under lower prices
  - Emissions approximately 8% higher.
- TAG determined that the higher energy price scenario should be used as a more realistic Reference Case
- Lower price scenario will be available if appropriate for some analysis of some policies.

Energy Act 2007

- Policies included in Energy Act will be added to Reference Case prior to analysis of policies approved by the Task Force
- Major policy areas affected:
  - Vehicle efficiency standards
  - Bio-fuel standard
  - Lighting and equipment efficiency regulations
  - Building standards
- Most of these policies were anticipated in proposed templates

Questions?

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