ESTABLISHING A CARBON BASELINE FOR THE CITY OF MADISON GOVERNMENT OPERATIONS

Report to the City of Madison Sustainable Design and Energy Committee

Madison, Wisconsin - April 19, 2010

UW-Madison Energy Analysis and Policy Capstone Group 2010

Establishing a Baseline: Benefits to the City of Madison

- Create a **cost effective** GHG reduction **strategy**
- Set **achievable targets**
- Environmental **leadership**
- Voluntary GHG reporting may be accepted by state and federal regulators in the future

ICLEI- Local Governments for Sustainability

- International Council for Local Environmental Initiatives
- Leading sustainability organization in the world
- founded in 1990
- Over 1,000 members
  - 600 in the U.S.
  - 78 in the Midwest
- Madison became a member in 2006

Five "Milestones" to Reduce Emissions

1. Conduct a baseline greenhouse gas emissions inventory and forecast
2. Adopt an emissions reduction target
3. Secure approval of a local climate action plan
4. Implement the plans, policies and measures
5. Monitor progress, report results and re-evaluate the plan

- Madison is currently at Milestone 1
  - About 1/3 of US ICLEI Member cities have completed the first milestone

The Tool: Local Government Operations Protocol (LGOP)

- Developed between ICLEI and multiple stakeholders
- Modeled off of the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*
  - developed by the **World Business Council for Sustainable Development** and the **World Resources Institute**
- Designed to provide a **standardized set of guidelines specific to local governments**

Reductions in emissions are reported by **comparing** emissions **over time,** accuracy and standardization is key

Software & Standards

- ICLEI created CACP software for local governments to perform GHG inventories

- Software follows LGOP standards for methodology

Greenhouse Gases

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perflorocarbons (PFCs)
- Sulfur Hexafluoride (SF_6)

- Carbon Dioxide Equivalent (CO_2e)
  - CH_4 → 21 times more potent than CO_2
  - N_2O →310 times more potent than CO_2

Setting City Operations Boundaries

- Accounting for GHGs for city owned facilities (not county/state/private)
- The city does not own and operate:
  - Dane Co. Airport
  - Dane Co. or any other landfill
  - Any Power Plants or Ports
- If the state/county perform GHG inventory, the city should work w/ them to avoid double-counting & non-counting

Emission Scopes

- Scope 1: Direct emissions:
  - Vehicle engine combustion
  - On-site NG combustion for heat
  - Refrigerants

- Scope 2: Indirect emissions:
  - Off-site electricity production
  - Off-site heat or steam

- Scope 3: Other indirect emissions:
  - Employee commute, waste prod., contracted services, etc.

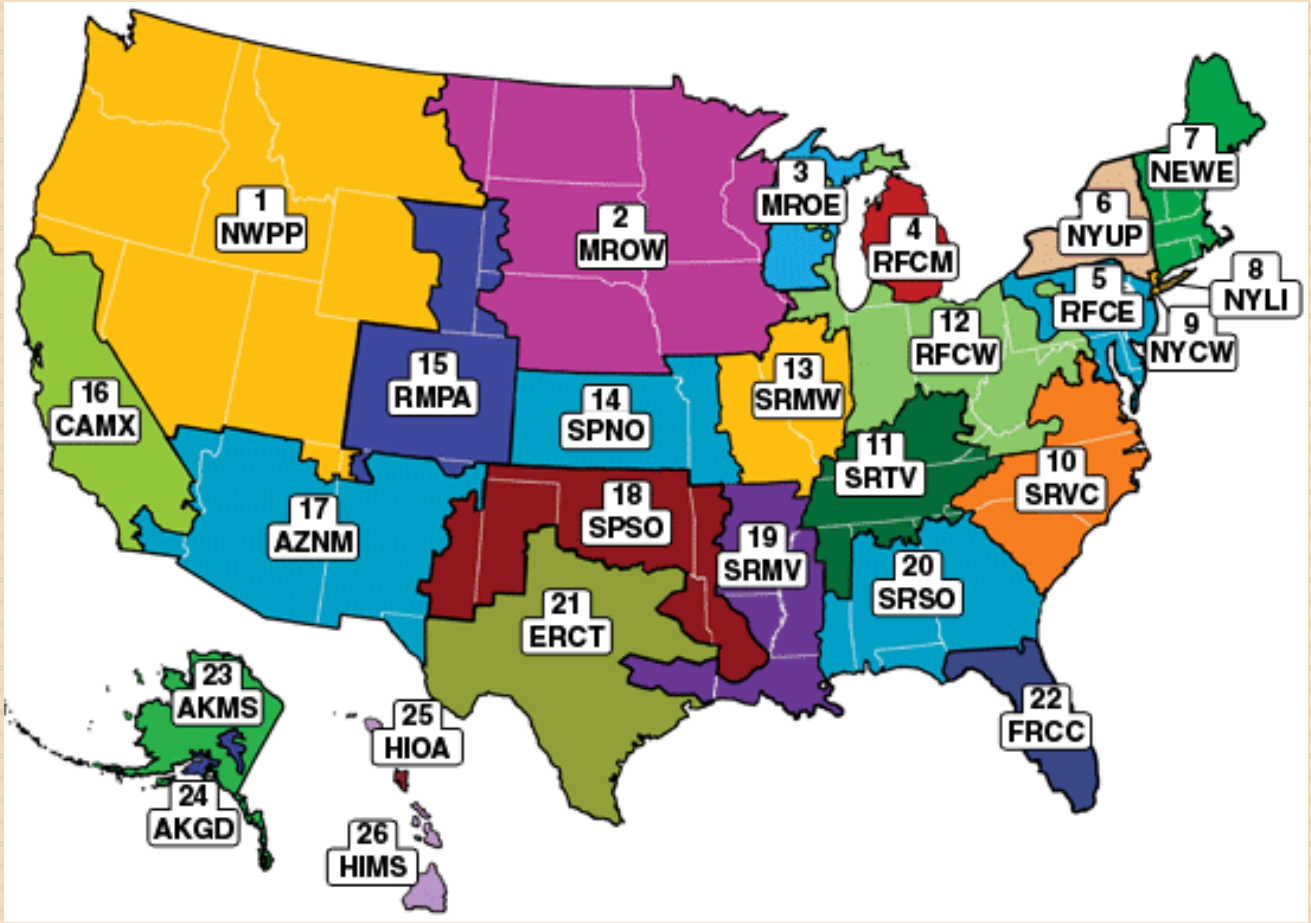
Government Sectors

- Buildings and other facilities (elect. & NG)
- Streetlights and traffic signals (elect.)
- Vehicle fleet (employees at work)
- Employee commute
- Transit fleet (Madison Metro Buses)
- Water delivery facilities
- Solid waste facilities
  - Maintenance of Closed Landfills
  - Employee Waste
- Refrigerants (not included in this study)
- Not applicable: power generation facilities, port facilities, airport facilities, other processes

Methodology

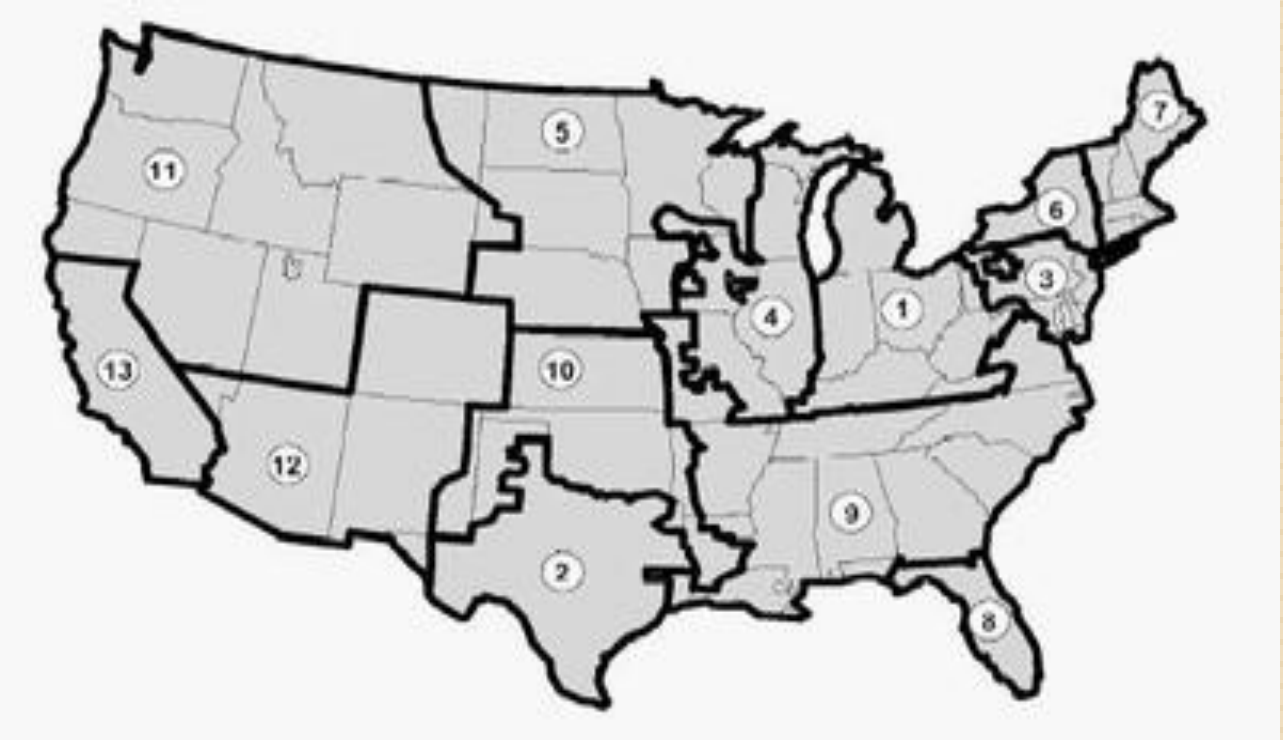
- Local government emissions Vs. community emissions
- 2007 base year
- Electricity Emission factors
  - EPA's eGrid coefficient set
    - CO2, N2O and CH4
  - North American Reliability Corporation (NERC)
    - NOx, SOx, CO, VOC and PM10

EPA eGRID Subregions



Source: USEPA - Green Power Partnership

NERC Regions For Emissions Inventory: Pre 2006



2005 Emission coefficients used for baseline

Data Collection

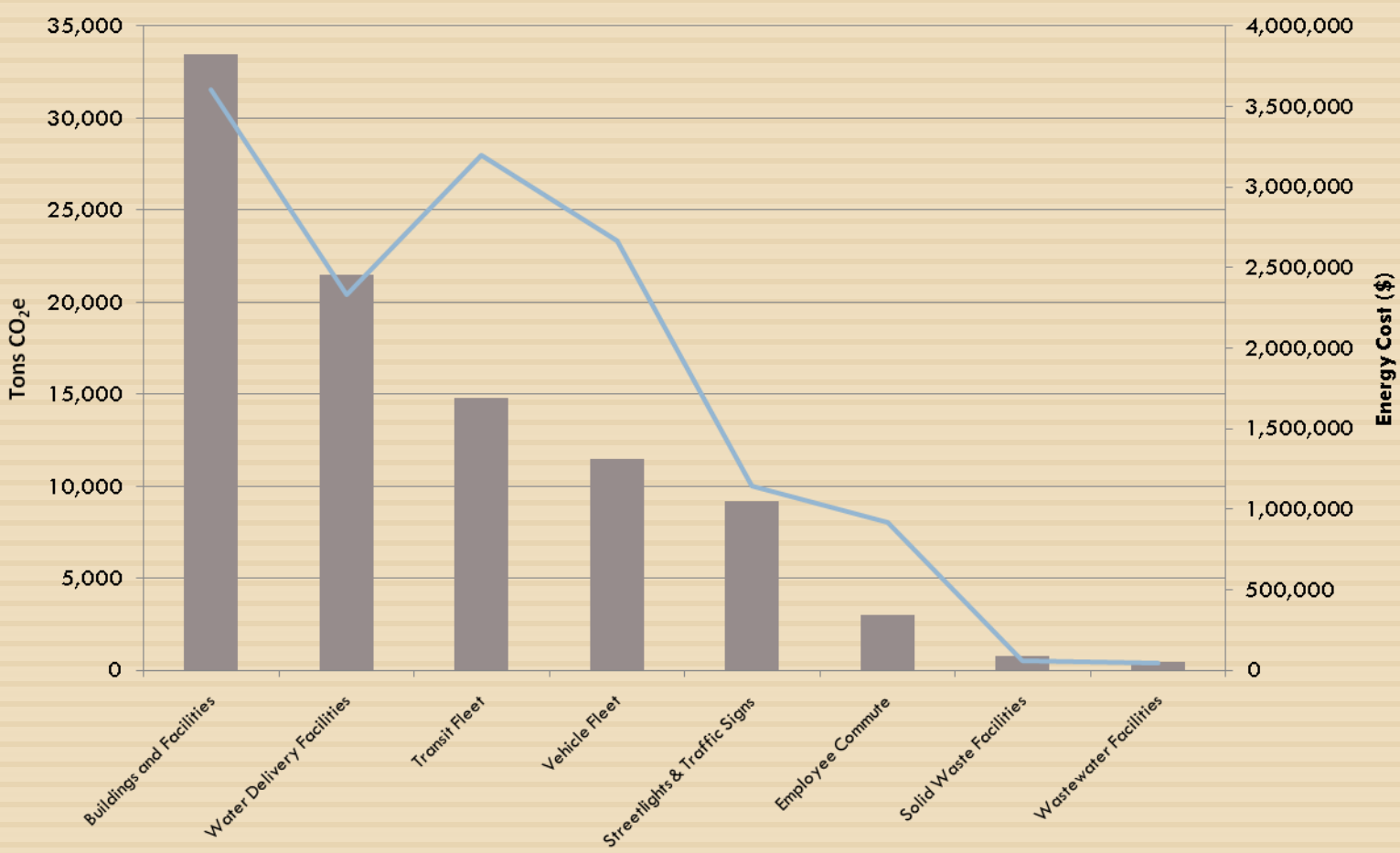
- City Engineering
  - Buildings & Facilities Sector
  - Streetlights & Traffic Signals
  - Waste Delivery Facilities
  - Wastewater Facilities
  - Solid Waste Facilities
- Fleet Services
  - Vehicle Fleet
- Employee Survey
  - Employee Commute
- Finance Department
  - Transit Fleet

Preliminary Results

City Operations Total Energy Use

- Electricity: 41,984,536 kWh
- Natural Gas: 1,240,116 therms
- Gasoline: 704,479 gal
- Diesel: 1,996,963 gal
- 702,325 MMBtu
  - 121,090 Barrels of Oil

- Total Emissions: 94,723 tons CO_2e



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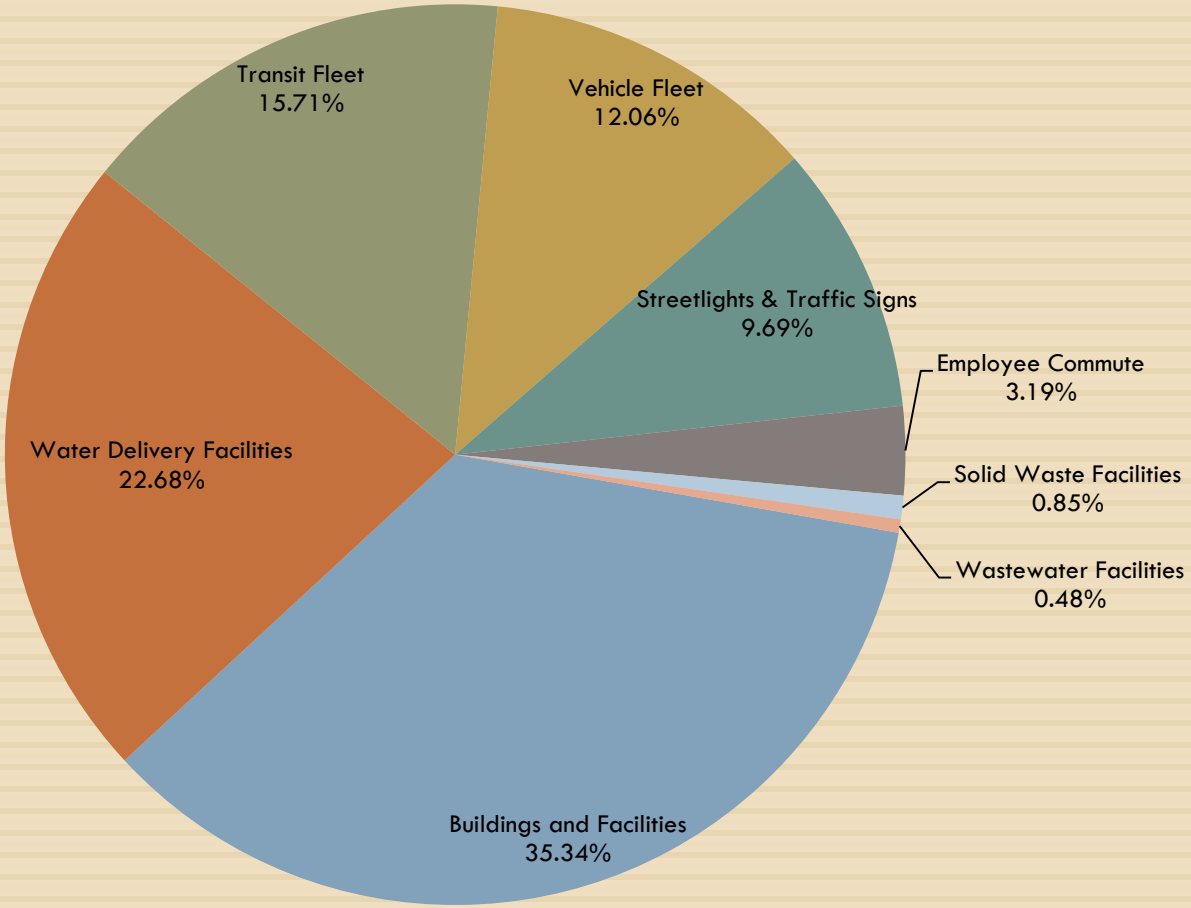
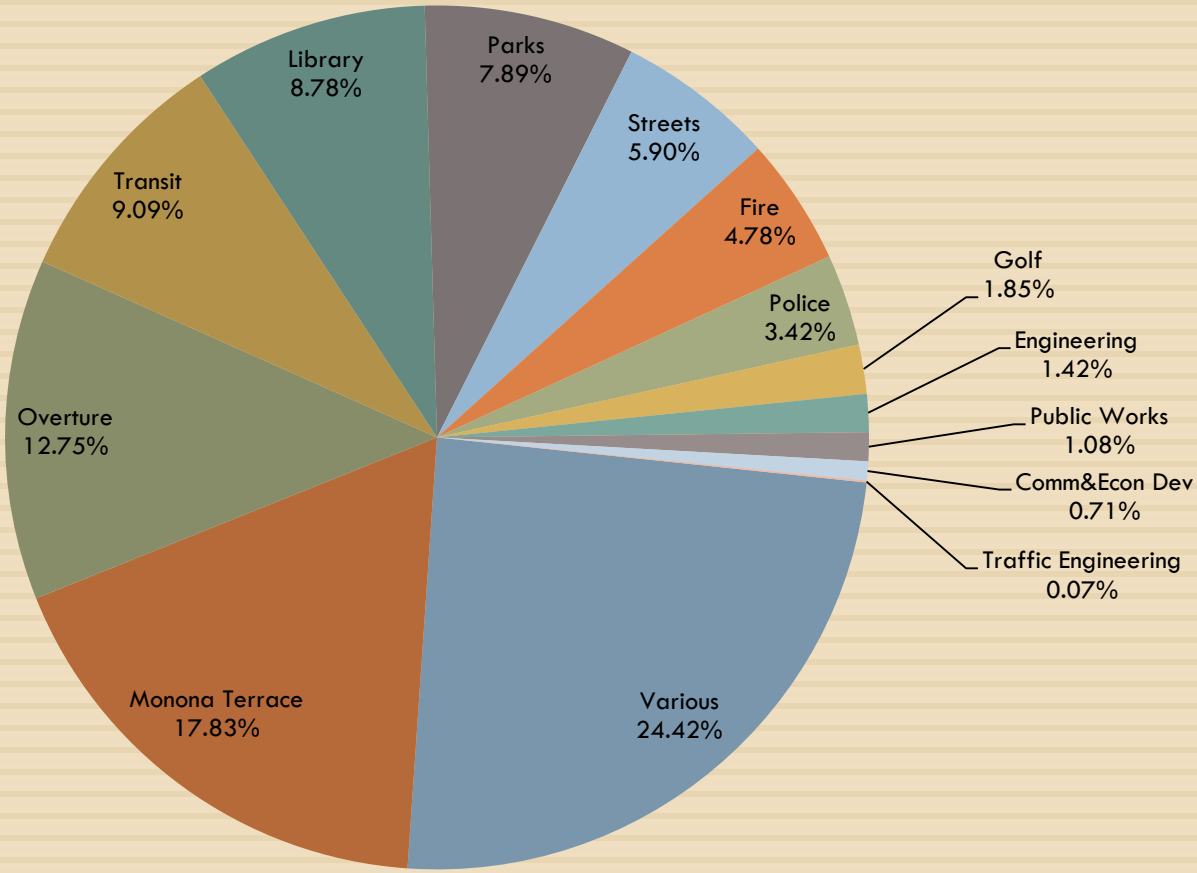
GHG Emissions by Sector

Total Emissions: 94,723 tons CO_2e

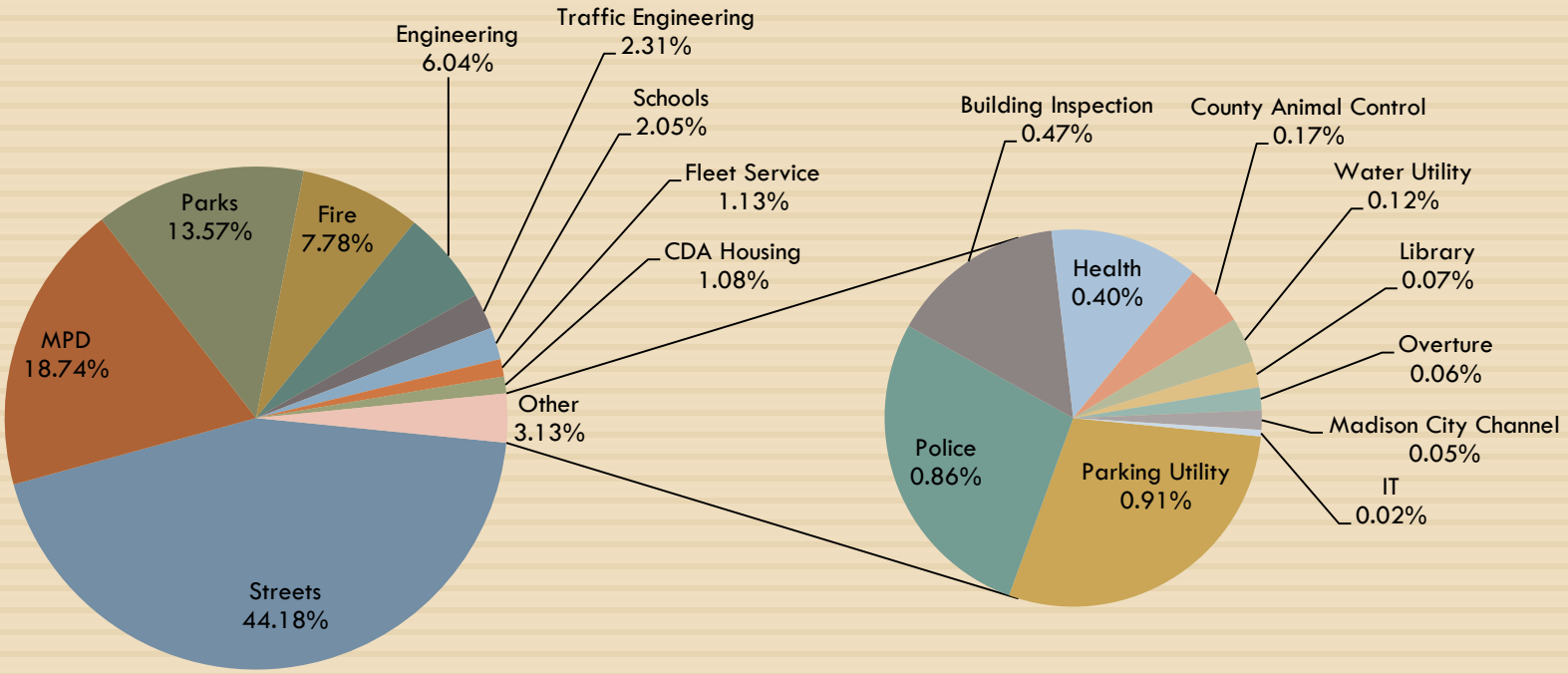


Share of GHG Emissions by Sector



Facilities Emissions By Agency

Various: City and County Building & Madison Municipal Building



Vehicle Fleet Emissions by Agency

4 agencies account for almost 85% of all vehicle GHG emissions

Recommendations

- Create baseline for city of Madison
- Identify next reporting year
- Identify process by which reporting will be done in the future
- Work with reporting systems to generate reports that can easily be transferred into the CACP software
- Begin tracking missing information

Questions?

Summary Table by Sector

	CO2 (tons)	N2O (lbs)	CH4 (lbs)	CO2 Equiv (tons)	CO2 Equiv (%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities	33,313	965	1,744	33,481	35.3	186,597	3,605,408
Water Delivery Facilities	21,373	700	683	21,489	22.7	82,904	2,329,753
Transit Fleet	14,809	94	97	14,825	15.7	183,698	3,199,043
Vehicle Fleet	11,371	518	982	11,462	12.1	142,466	2,665,828
Streetlights & Traffic Signs	9,130	239	618	9,173	9.7	62,986	1,145,835
Employee Commute	3,008	190	135	3,039	3.2	38,502	918,666
Solid Waste Facilities	798	12	35	800	0.8	3,492	59,942
Wastewater Facilities	451	15	14	454	0.5	1,680	48,821
Total	**94,255**	**2,732**	**4,308**	**94,723**	**100**	**702,325**	**13,973,296**

Emissions By Source

	CO2 (tons)	N2O (lbs)	CH4 (lbs)	CO2 Equiv (tons)	CO2 Equiv (%)	Energy (MMBtu)	Cost ($)
Electricity	57,495	1,903	1,729	57,808	61	213,907	6,217,345
Diesel	16,739	99	104	16,755	17.7	207,588	3,632,065
Natural Gas	7,238	27	1,364	7,257	7.7	123,752	972,414
Gasoline	6,782	413	367	6,850	7.2	86,807	1,864,800
OFF ROAD Diesel	5,595	287	735	5,647	6	69,342	1,266,337
Carbon Dioxide	333	0	0	333	0.4	0	0
OFF ROAD Gasoline	73	4	8	73	0.1	929	20,336
Total	**94,255**	**2,732**	**4,308**	**94,723**	**100**	**702,325**	**13,973,296**

- "Carbon Dioxide" is estimated emissions from government employee solid waste

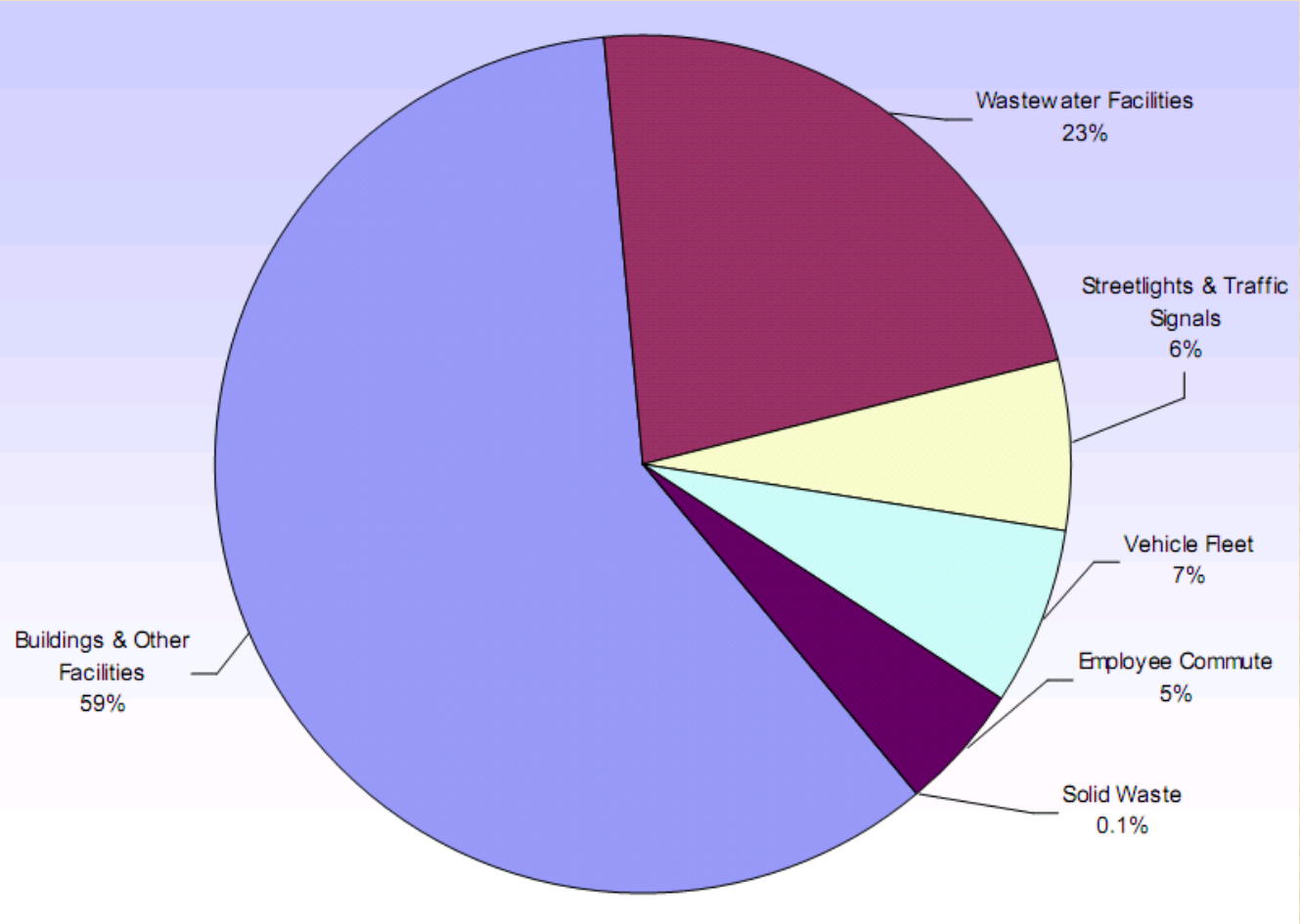
Facilities Emissions Summary

	CO2 (tons)	N2O (lbs)	CH4 (lbs)	CO2 Equiv. (tons)	CO2 Equiv (%)	Energy (MMBtu)	Cost ($)
Various	8,138	214	541	8,177	8.6	55,325	677,539
Monona Terrace	5,938	197	179	5,971	6.3	22,093	642,157
Overture	4,245	137	145	4,268	4.5	17,248	467,019
Transit	3,029	98	104	3,045	3.2	12,325	333,292
Library	2,923	89	128	2,939	3.1	14,245	334,539
Parks	2,629	70	172	2,642	2.8	17,600	327,031
Streets	1,969	45	171	1,977	2.1	16,729	264,285
Fire	1,594	37	134	1,601	1.7	13,226	212,231
Police	1,141	31	74	1,146	1.2	7,555	141,463
Golf	615	19	25	618	0.7	2,843	69,526
Engineering	472	10	44	474	0.5	4,240	64,604
Public Works	360	10	19	361	0.4	2,001	42,506
Comm&Econ Dev	236	7	9	237	0.3	1,074	26,579
Traffic Engineering	24	1	1	25	0	91	2,639
Total	**33,313**	**965**	**1,744**	**33,481**	**35.3**	**186,597**	**3,605,408**

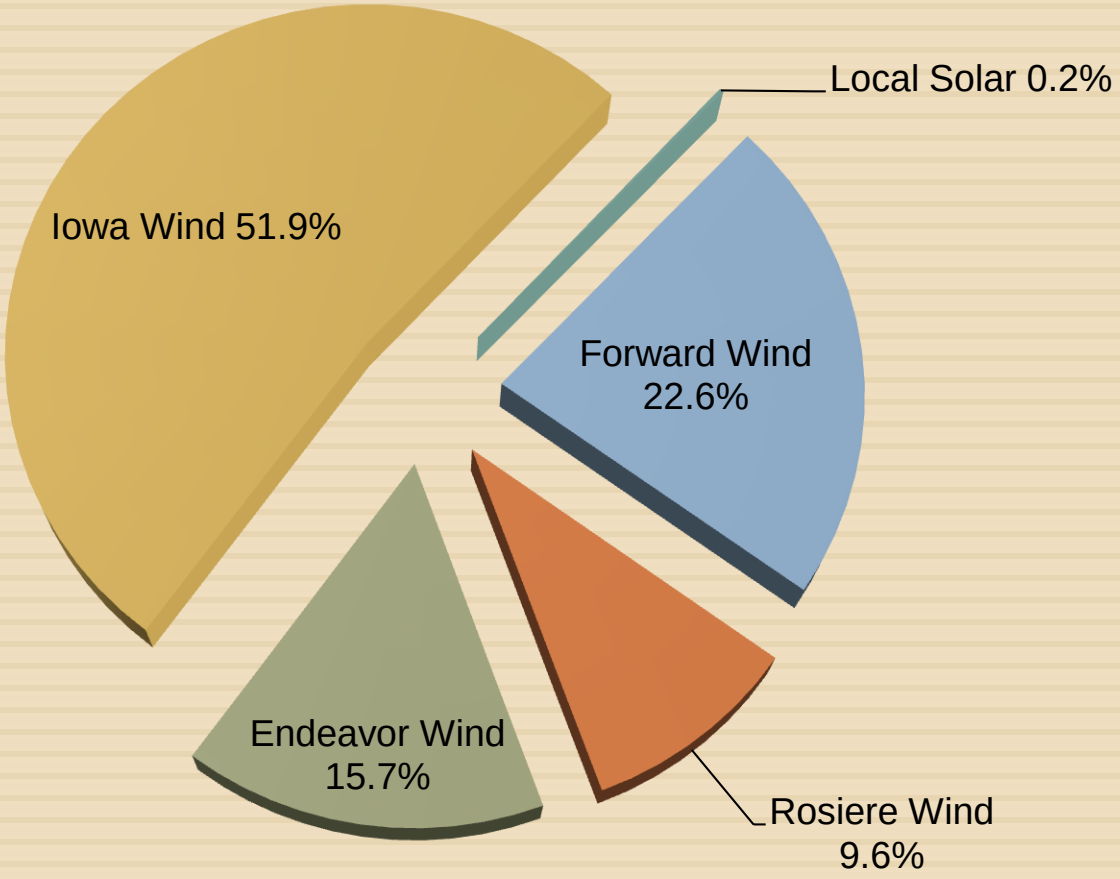
Vehicle Emissions Summary

	CO2 (tons)	N2O (lbs)	CH4 (lbs)	CO2 Equiv. (tons)	CO2 Equiv (%)	Energy (MMBtu)	Cost ($)
Streets	5,024	223	512	5,064	5.3	62,358	1,132,878
MPD	2,133	90	128	2,148	2.3	27,296	534,620
Parks	1,541	78	161	1,555	1.6	19,303	371,837
Fire	886	38	66	892	0.9	11,015	207,275
Engineering	689	19	33	692	0.7	8,597	158,389
Traffic Engineering	262	16	19	265	0.3	3,302	61,529
Schools	233	8	21	235	0.2	2,898	52,843
Fleet Service	128	12	10	129	0.1	1,628	30,893
CDA Housing	121	14	11	124	0.1	1,550	29,613
Parking Utility	103	5	5	104	0.1	1,309	24,572
Police	99	3	6	99	0.1	1,263	24,176
Building Inspection	53	4	3	54	0.1	679	12,946
Health	45	2	2	46	0	581	11,001
County Animal Control	19	2	1	19	0	237	4,524
Water Utility	13	1	1	14	0	172	3,506
Library	7	1	1	8	0	95	1,782
Overture	7	0	0	7	0	84	1,603
Madison City Channel	6	0	0	6	0	73	1,367
IT	2	0	0	2	0	25	473
Total	**11,371**	**518**	**982**	**11,462**	**12.1**	**142,466**	**2,665,828**

Washington D.C. Emissions by Sector '06

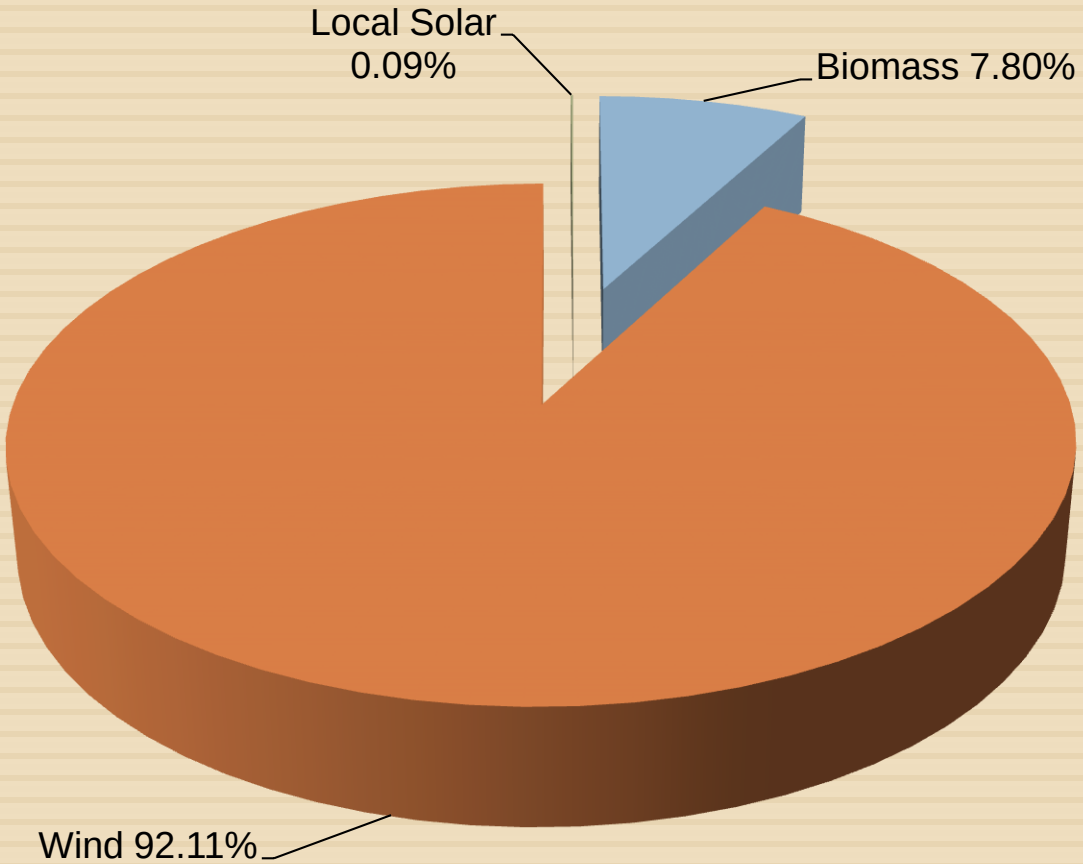


719,896 Tons CO_2e



MG&E's GPT Renewable Energy Mix: 2009

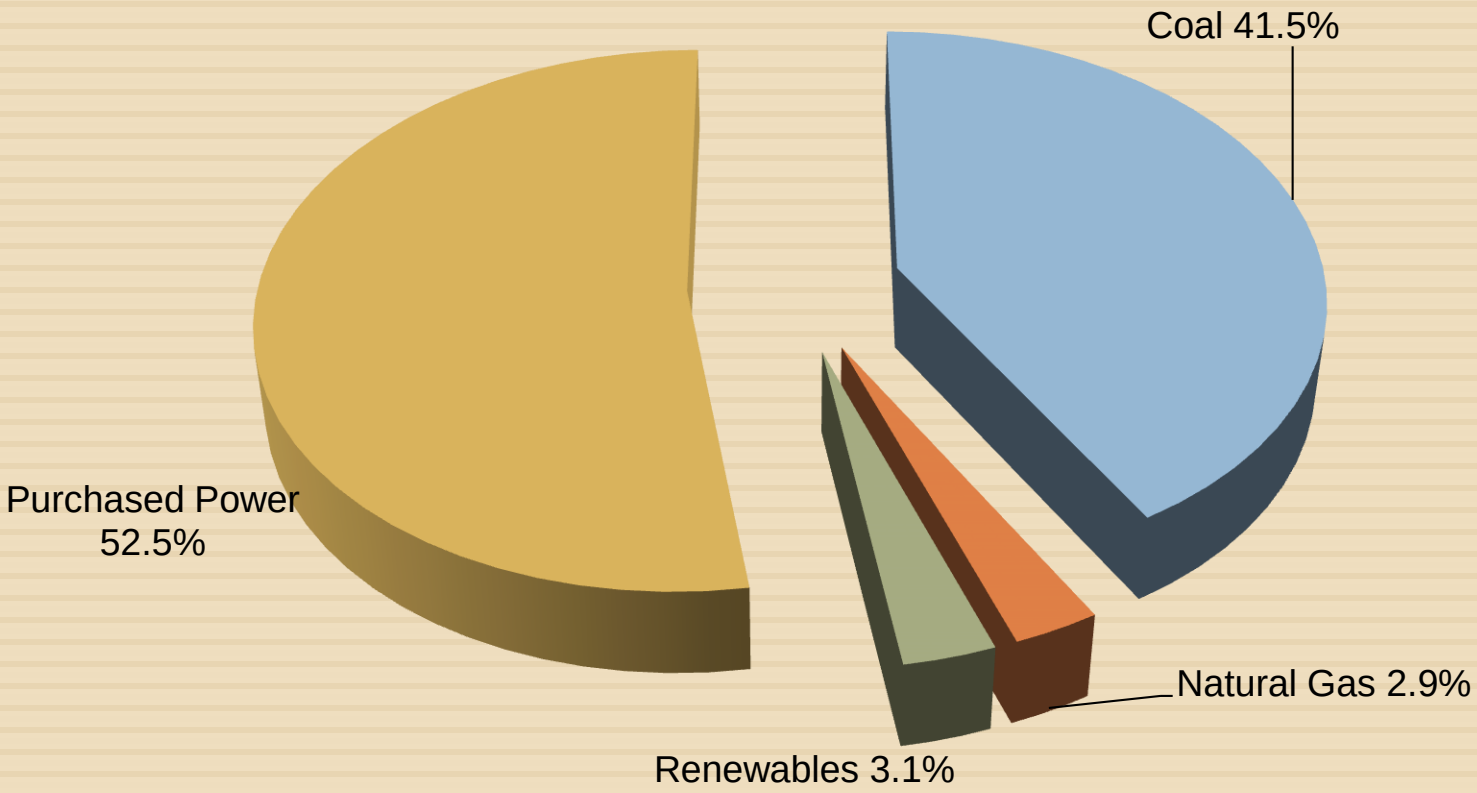
99.8% Wind



MG&E's non-GPT Renewable Energy Mix: 2009

Source: MG&E GPT e-brochure

MG&E's Energy Mix Based on Sales: 2009



12% Renewable Mix