WATER DEMAND SCENARIOS:
UNDERSTANDING and APPLICATION

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Data from Professor Dziegielewski's and
Wittman Hydro Planning Associates Inc.
water demand reports (2008)

COMPARISONS:
NE ILLINOIS & E-C ILLINOIS
(gallons per capita per day without electric power)

NE ILLINOIS			E-C ILLINOIS		
Population	2005	8.74M	Population	2005	1.09M
	2050	12.11M		2050	1.34M
GPCD	2005 normal	169	GPCD	2005 normal	312
	2050 LRI	131		2050 LRI	342
	2050 CT	166		2050 CT	382
	2050 MRI	201		2050 MRI	426

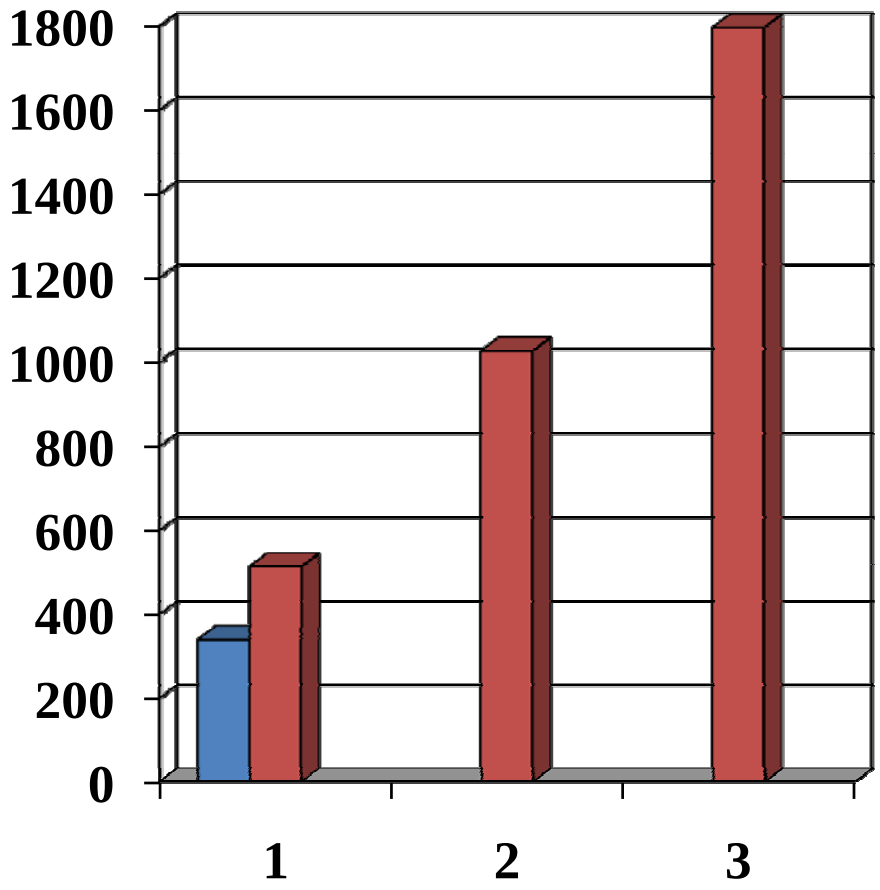
WATER DEMAND (million gallons per day) without electric power

NE ILLINOIS		
2005 NORMAL	1,480	
2050 LRI	+107	+7%
2050 CT	+530	+36%
2050 MRI	+949	+64%
DROUGHT CT	+128	+9%
+3°F TEMP CT	+89	+6%
CT+DR+3°F	+747	+50%
PEAK SEASON	x0.2 - x2.0	
PEAK DAY	x1.6 – x3.0	

E-C ILLINOIS		
2005 NORMAL	339	
2050 LRI	+120	+35%
2050 CT	+174	+51%
2050 MRI	+233	+69%
DROUGHT CT	+106	+31%
+3°TEMP CT	+39	+12%
CT+DR+ 3°F	+319	+93%
PEAK SEASON	x0.2 - x2.7	
PEAK DAY	x1.6 – x7.0	

EAST-CENTRAL ILLINOIS
WATER DEMAND TO 2050 (MGD)
CURRENT TRENDS SCENARIO [blue = 2005 normal]

1. CT Scenario
   (average annual daily)
2. Peak season (x2?)
3. Peak day (x3.5?)



ELASTICITIES OF EXPLANATORY VARIABLES PUBLIC WATER SUPPLIES (1985-2005)

NE ILLINOIS	
Summer temp	1.10
Summer precip	-0.09
Empl/pop ratio	0.09
Water price	*-0.15*
Income	*0.28*
Conservation	*-0.06*

E-C ILLINOIS	
Summer temp	1.42
Summer precip	-0.11
Empl/pop ratio	0.64
Water price	*-0.22*
Income	*0.32*
Conservation	*-0.003*

E-C ILLINOIS:
SENSITIVITY TO CHANGING VALUES OF VARIABLES
Public Water Supply

Variable	a) 20% change in GPCD can be achieved by changing the variables by the following %	b) If the variables change by 20% GPCD changes by the following %
Household income	62%	6%
Water conservation	6,666%	0.06%
Water price	91%	4%
Employ/population ratio	31%	13%
Summer temperature	14% (= 11^{o}F)	28% (= 23^{o}F)
Summer precipitation	182% (= 33 ins)	2% (= 0.4ins)

Population: a 20% change in population would result in a 20% change in water demand, if GPCD remains constant

Public Water Supply:

EXPLANATORY VARIABLES USED TO 2050

NE ILLINOIS

Population +39%

Empl/pop ratio constant

LRI

Income +0.5% yr

Water price +2.5% yr

Conservation Historical trend +50%

+more people Cook & DuPage

CT

Income +0.7% yr

Water price +0.9% yr

Conservation Historical trend

MRI

Income +1.0% yr

Water price 0% yr

Conservation trend removed

+ more people Kane, Kendall & McHenry

E-C ILLINOIS

Population +28%

Empl/pop ratio constant

LRI

Income +0.5% yr

Water price +1.5% yr

Conservation reduced to 10% historical

CT

Income +0.7% yr

Water price 0% yr

Conservation reduced to10% historical

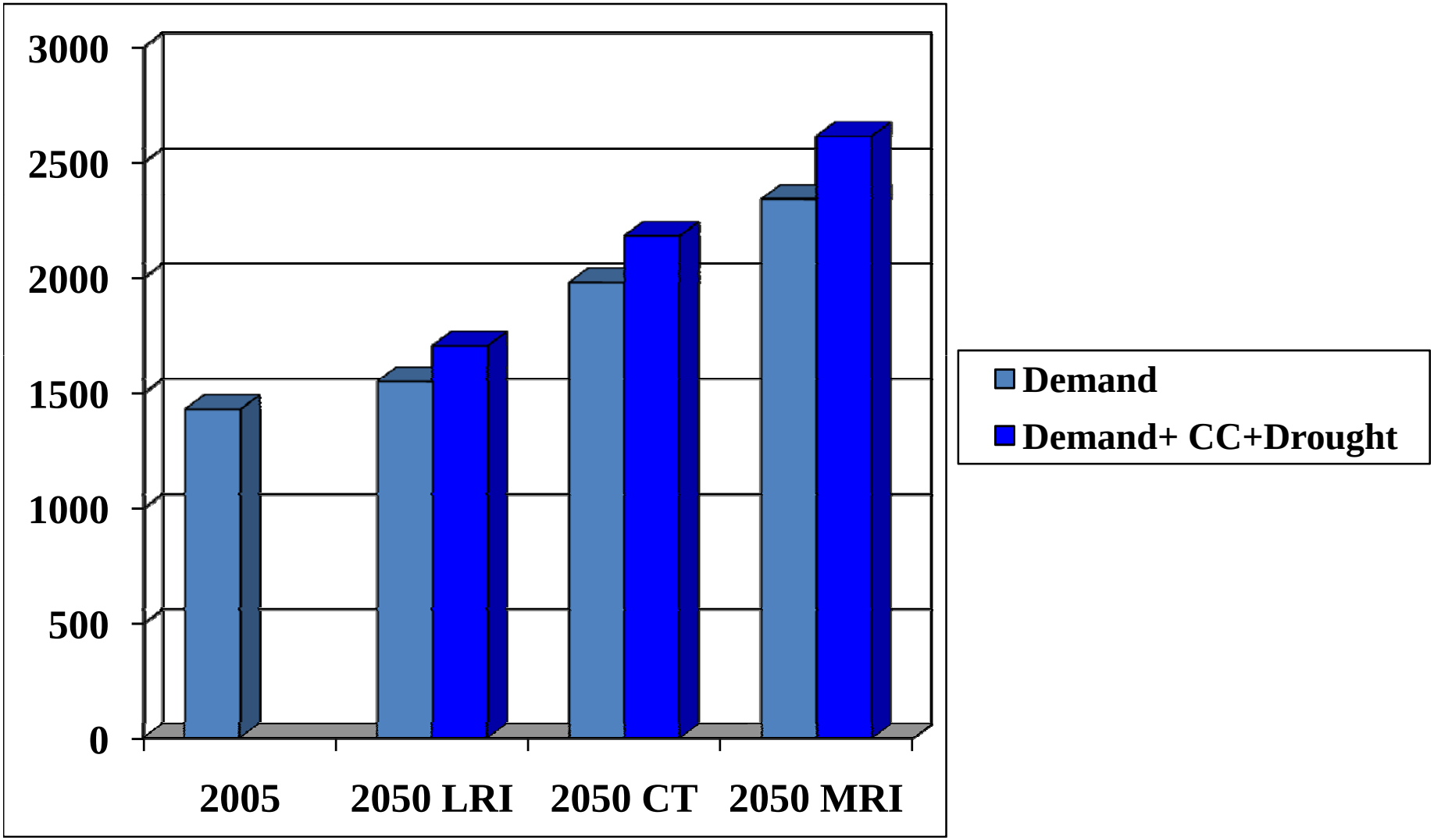
MRI

Income +1.0% yr

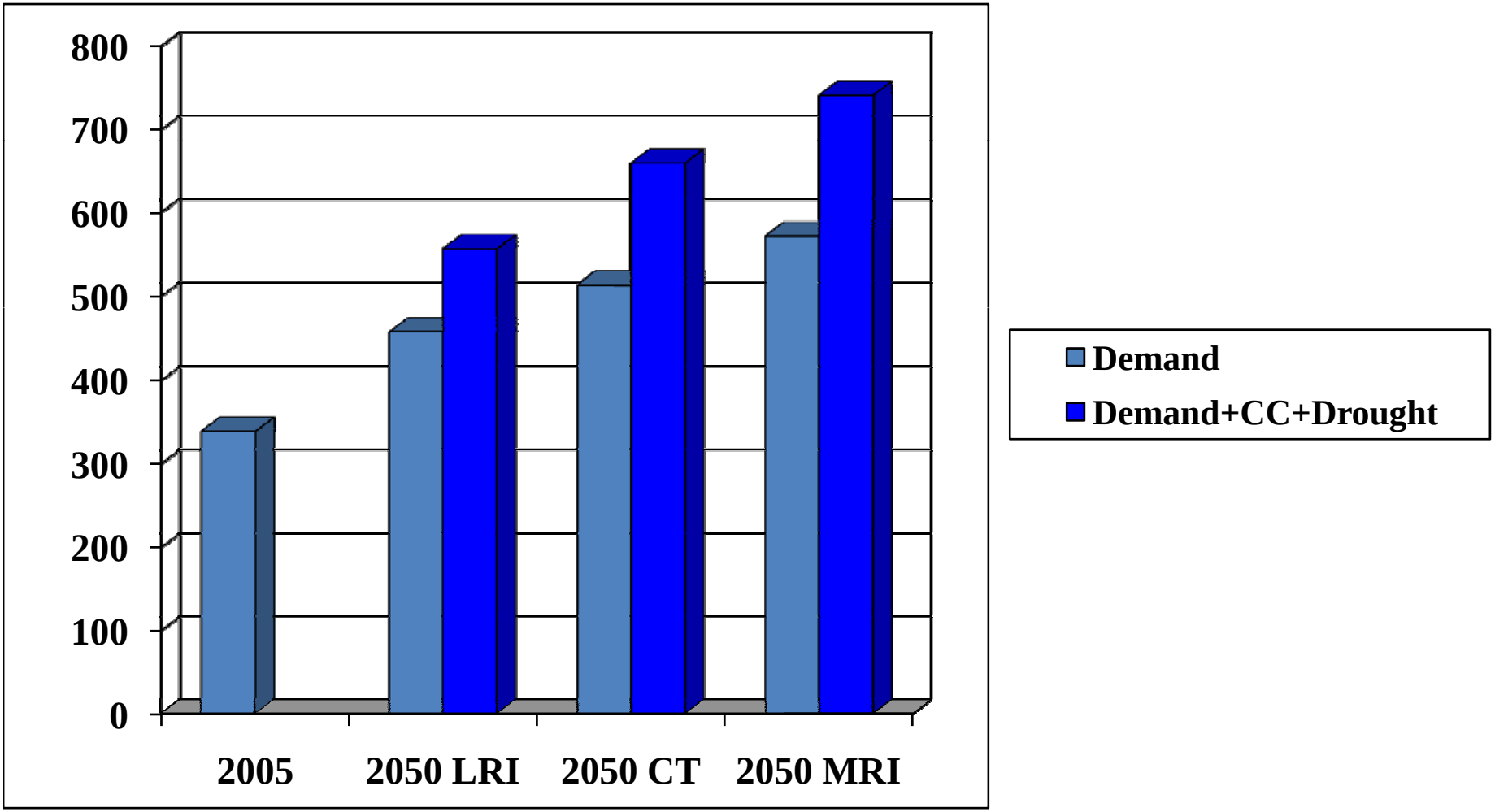
Water price 0% yr

Conservation trend removed

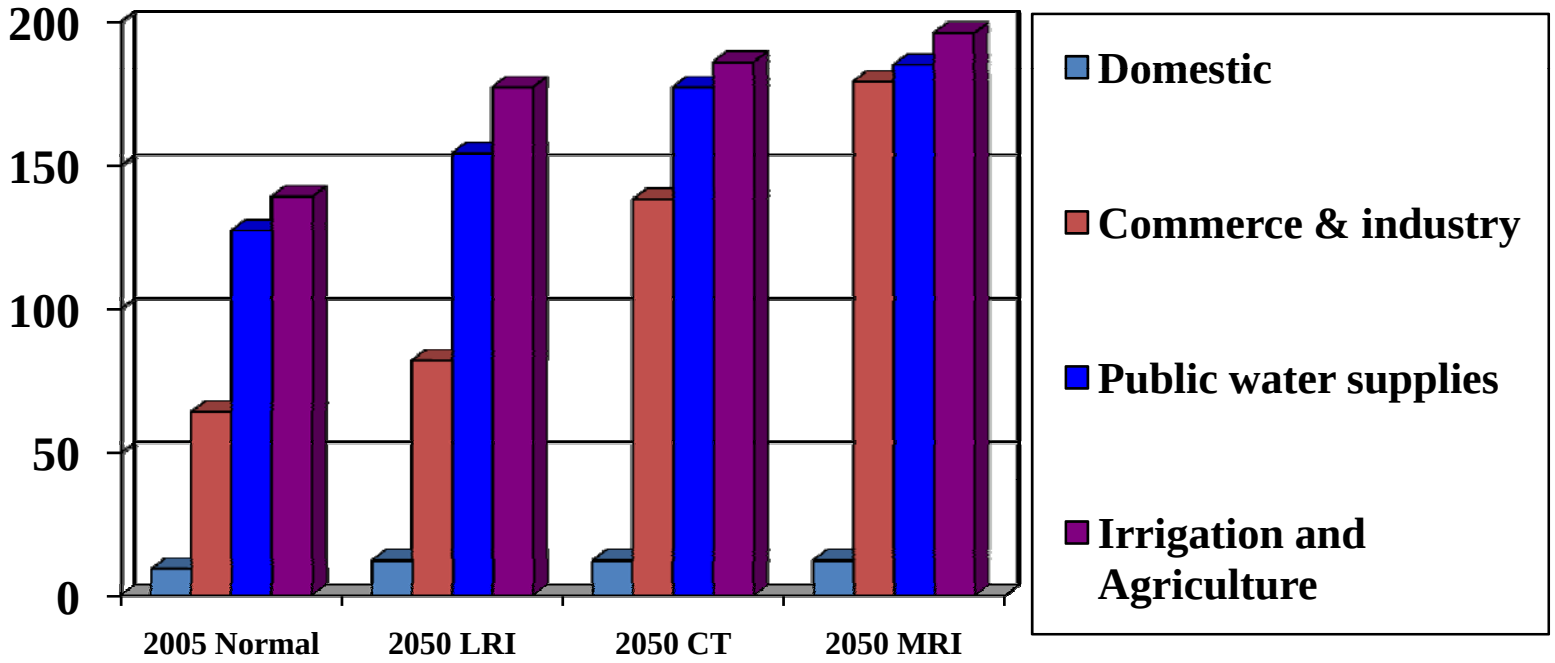
WATER DEMAND TO 2050 (mgd): 11 COUNTIES NE ILLINOIS
(Same % increases for drought and climate change assumed for LRI and MRI scenarios as in CT scenario)



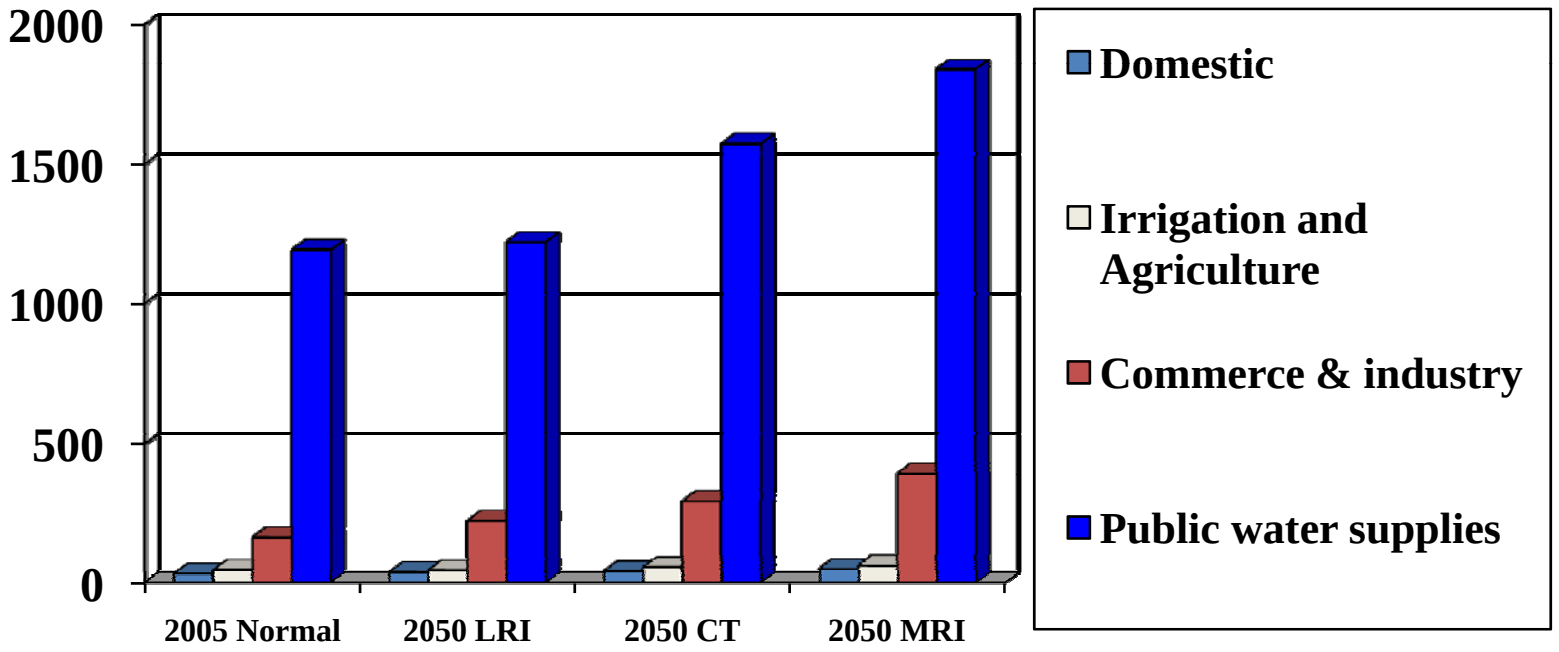
WATER DEMAND TO 2050 (mgd):
15 COUNTIES EAST-CENTRAL ILLINOIS
(Same % increases for drought and climate change assumed for LRI and MRI scenarios as in CT scenario)



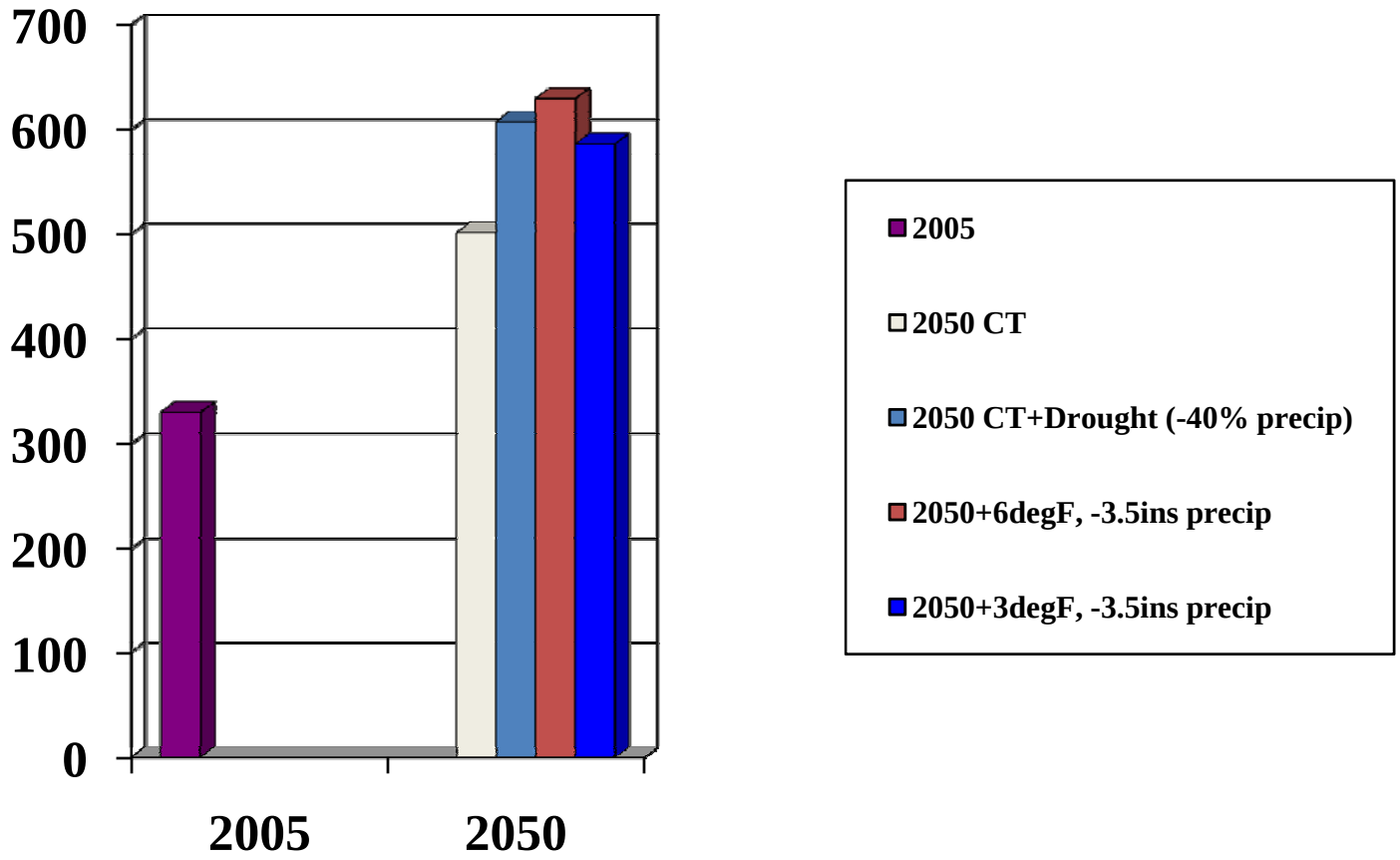
Water withdrawals in East-Central Illinois (mgd) by water-use sector – excluding power generation



Water withdrawals in Northeastern Illinois (mgd) by water-use sector – excluding power generation



East-Central Illinois:
Effects of drought and climate change on water withdrawals (mgd): CT scenario



CONCLUSIONS

- **Regional approach selected because of regional differences**
- NE and EC Illinois are very different regions
- Population in NE Illinois projected to increase by 3.4 million and in Illinois by 0.3 million
- Much more water needed in NE Illinois although % increase is larger in EC Illinois
- CMAP – committed to integrated regional planning and management
- Much more irrigation in EC Illinois
- Wide range of uncertainty in future water demands
- Assumptions about future water demands different in 2 regions
- No reason why management plans for NE and EC Illinois should be the same

CONCLUSIONS (contd.)

- Planning for drought with 40% below normal precipitation could give slightly more protection than planning for climate change with precipitation 3.5ins below normal and an increase in temperature of 3^{o}F.

QUESTIONS for the RWSPC

- How can 3 scenarios be used?
- Select one scenario as the best planning scenario to 2050?

  2005 (339mgd) +CT (+174mgd) + drought (+106mgd)

  = 619mgd = +83%
- Texas model would be:

  2005(339mgd) +pop.increase (+102mgd) + drought (+106mgd) = +547mgd = +61%

- Would there be any reason to recommend a decrease in water withdrawals below a baseline scenario? e.g. if ISWS analysis indicates impacts of these withdrawals are unacceptable to you, or you conclude that current and future water-use practices should be more efficient.