

# RECLAMATION

*Managing Water in the West*

## **Proposal for Greenhouse Gas Modeling of the Santa Ana Watershed's Water Sector**

*February 2, 2012*



U.S. Department of the Interior  
Bureau of Reclamation

# Overview

- Green House Gas Emissions (GHGE)
- Assembly Bill 32
- Water Sector Involvement
- Research Goals
- Research & Data Collection
- Data Evaluation & Model Development
- Modeling & Deliverables

# Why GHGE?

## GHGE Contribute to Climate Change

- Economic well-being
- Public health
- Agricultural production
- Land use
- Water availability
- Flooding



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# Why California?

## California's Actions Alone Cannot Change Global Trajectory of Climate Change

- Global leadership
- Reduce fossil fuel dependence
- Stimulate economy
- Strengthen infrastructure
- Clean air and water



# AB 32: Global Warming Solutions Act

- Passed in 2006
- Links anthropogenic GHGE and climate change
- Provides timeline for statewide GHGE reduction
- Requires quantitative accounting of GHGE
- Enforces disclosure of GHGE



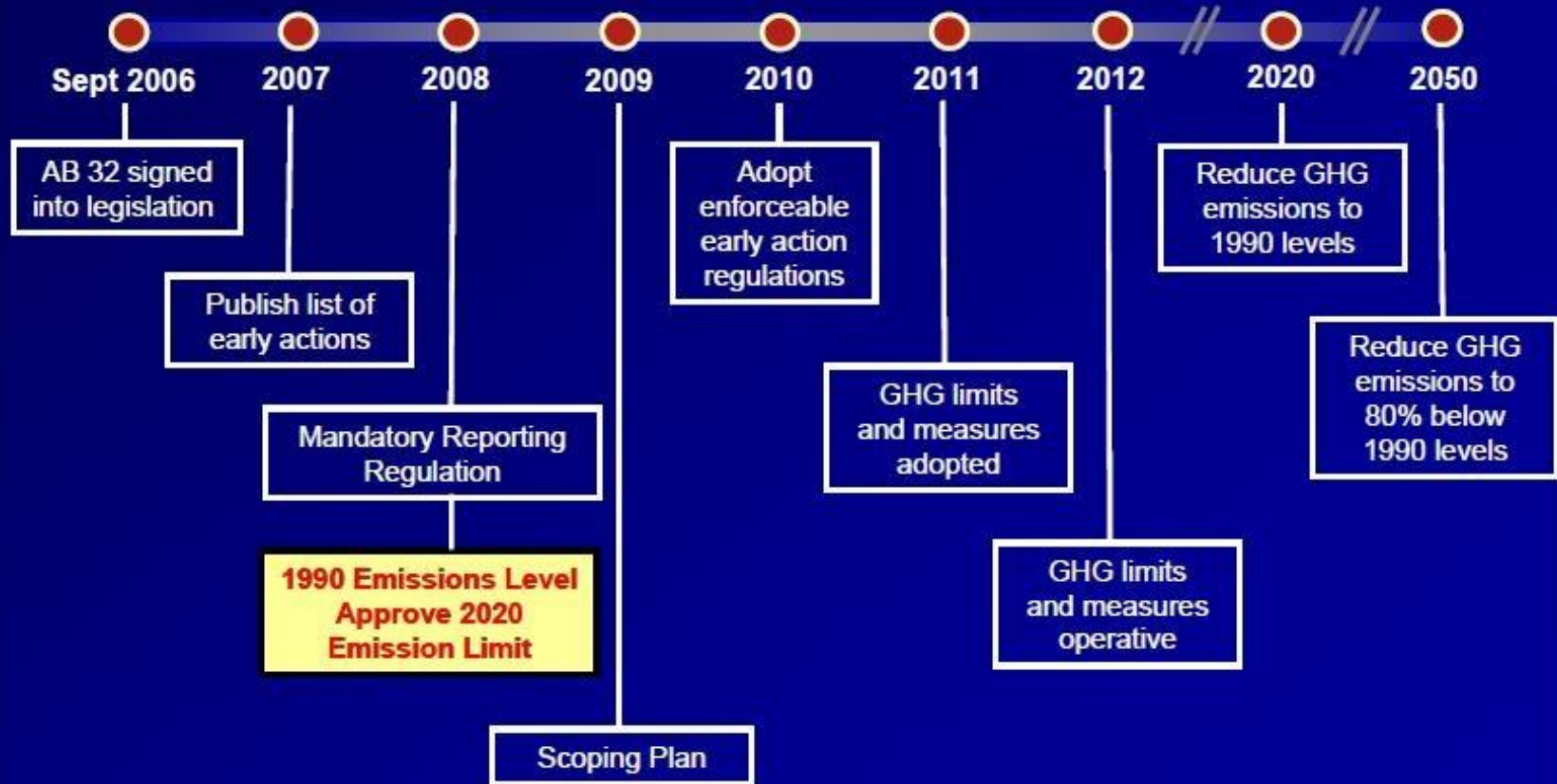
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# AB 32: Global Warming Solutions Act

## Ch2: Findings and Declarations

- “Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California.”
- “Global warming will have detrimental effects on some of California’s largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry.”

# California Global Warming Solutions Act of 2006 (AB 32)

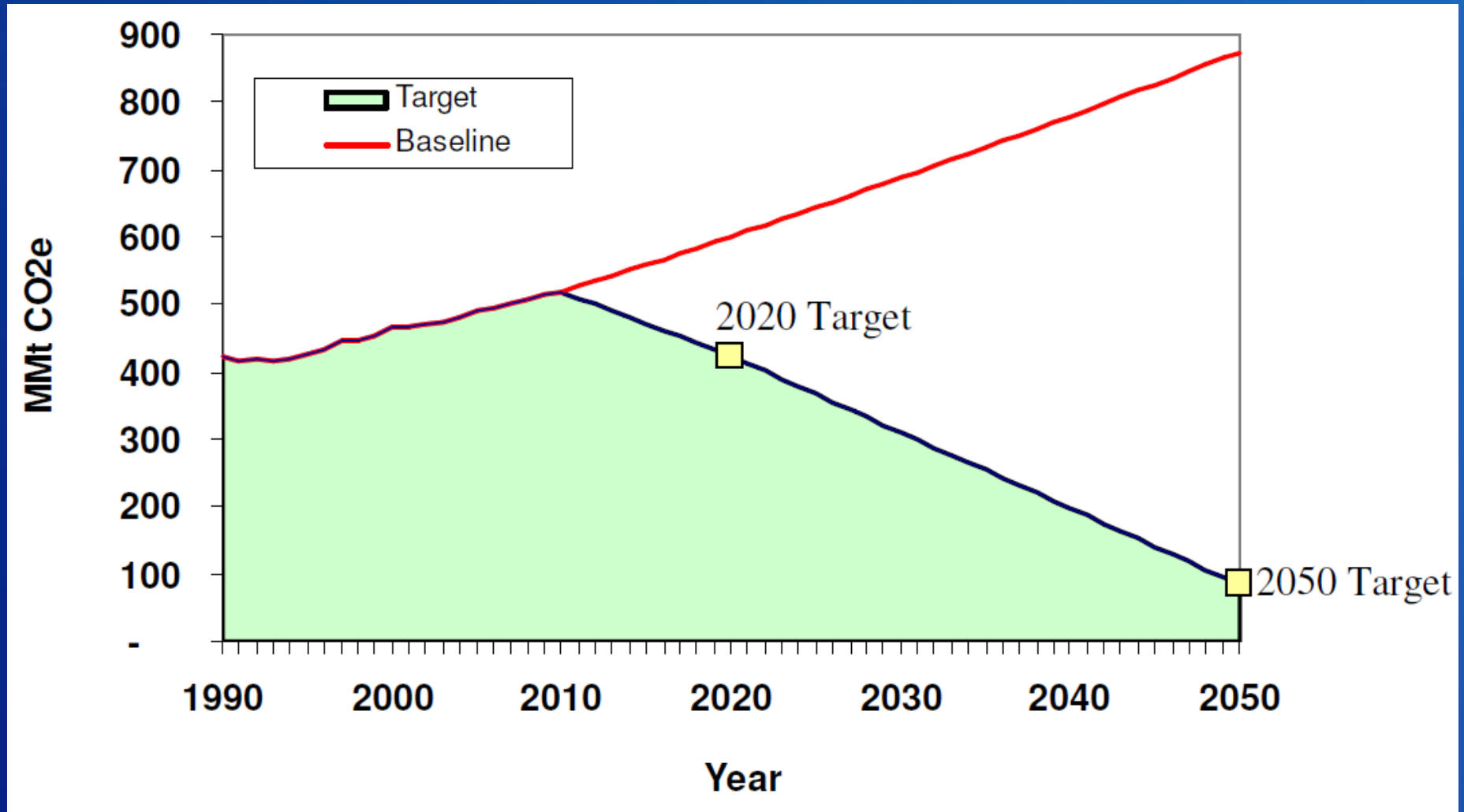


# AB 32: Global Warming Solutions Act

- Applies to 6 Greenhouse Gases
  - Carbon dioxide
  - Methane
  - Nitrous oxide
  - Hydrofluorocarbons
  - Perfluorocarbons
  - Sulfur hexafluoride
- Expressed as CO<sub>2</sub>e



# AB 32: Targets



[http://ethree.com/documents/GHG6.10/CA\\_2050\\_GHG\\_Goals.pdf](http://ethree.com/documents/GHG6.10/CA_2050_GHG_Goals.pdf)

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# AB 32: 2020 Statewide Baseline (MMTCO<sub>2</sub>e)

596

- Business-As-Usual (2008)
- Pre-economic downturn

545

- Recalculation post-economic downturn

507

- Adjusted calculation in 2010

427

- 2020 Emissions Target

# GHGE For the Water Sector

## Goals of this study

- Explore links between water resources, energy, and GHGE
- Develop a decision making tool
- Compliance to AB 32
- Reporting for AB 32
- Consider both supply and demand options
- Provide recommendations to meet GHGE targets

# GHGE for the Water Sector

- Phase 1 – Research & Data Collection
  - Review Reporting Requirements
  - Definitions of Water Sector Categories
  - Literature Review
  - Inventory GHGE Sources in Santa Ana Watershed
- Phase 2 – Data Evaluation & Model Development
  - Evaluate Emissions from Each Source
  - Develop GHGE Calculator
- Phase 3 – Modeling & Deliverables
  - Use Calculator to Develop Emission Scenarios
  - Develop List of Recommendations
  - Deliverables

# Phase 1 – Research & Data Collection

## Review Reporting Requirements

- Assembly Bill 32: Global Warming Solutions Act of 2006
- Scoping plan



GREENHOUSE  
GAS PROTOCOL

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# Phase 1 – Research & Data Collection

## Definitions of Water Sector Categories

- Habitat management
- Recreation
- Flood Control
- Hydropower
- Wastewater
- Drinking water
- Water conveyance
- Irrigation



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# Phase 1 – Research & Data Collection

## Literature Review

- Preliminary Results
  - Conservation
  - Efficiency
  - Alternative fuels



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# Phase 1 – Research & Data Collection

## Inventory GHGE Sources in Santa Ana Watershed

- Water infrastructure
- Treatment plants
- Pumping stations
- Hydropower generation
- Recreation facilities



# Phase 2 – Data Evaluation & Model Development

## Evaluate Emissions from Each Source

- Identify facility specifics
- Quantify energy use
- Determine energy source



# Phase 2 – Data Evaluation & Model Development

## Develop GHGE Calculator

- Excel interface
- Allow stakeholders to evaluate current emissions
- Implement modifications
- Determine effectiveness and cost of modifications



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# Phase 2 – Data Evaluation & Model Development

Change in Annual Growth Rate 0.0% State Average Growth Ref. Case 1.2% User Case 0.3%

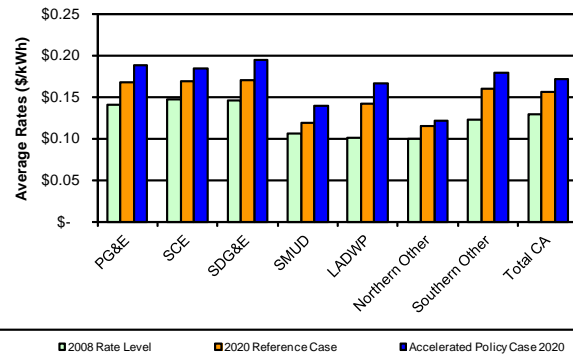
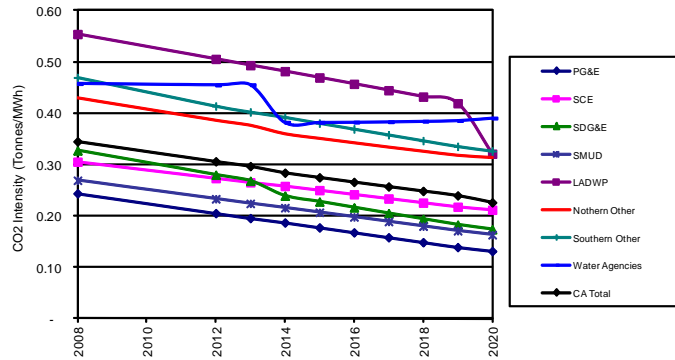
## Peak Demand Forecast (MW)

Resource Zone Name	Plexos Reference Case			User Case (not adjusted for changes in DR or EE)			Change in Forecast 2020 Increase (MW)
	2008 Net Peak (MW at generator)	2020 Net Peak (MW at generator)	Annual Avg. Growth in Peak 2008-2020 (%)	2008 Net Peak (MW at generator)	2020 Net Peak (MW at generator)	Annual Avg. Growth in Peak 2008-2020 (%)	
PG&E	19,247	22,655	1.4%	19,247	22,655	1.4%	0
SCE	19,861	24,137	1.6%	19,861	24,137	1.6%	0
SDG&E	3,970	4,804	1.6%	3,970	4,804	1.6%	0
SMUD	3,174	3,734	1.4%	3,174	3,734	1.4%	0
LADWP	5,717	6,005	0.4%	5,717	6,005	0.4%	0
NorCal	4,229	4,854	1.2%	4,229	4,854	1.2%	0
SoCal	5,797	6,542	1.0%	5,797	6,542	1.0%	0
WaterAgencies	1,243	1,241	0.0%	1,243	1,241	0.0%	0

## Energy Demand Forecast (GWh)

Resource Zone Name	Plexos Reference Case			User Case (not adjusted for changes in DR or EE)			2020 Increase (GWh)
	Retail 2008 Load at Gen (GWh)	Retail 2020 Load at Gen (GWh)	Avg. Annual Growth in Load 2008-2020 (%)	Retail 2008 Load at Gen (GWh)	Retail 2020 Load at Gen (GWh)	Avg. Annual Growth in Load 2008-2020 (%)	
PG&E	81,243	95,046	1.3%	81,243	95,046	1.3%	0
SCE	82,366	99,268	1.6%	82,366	99,268	1.6%	0
SDG&E	17,448	21,143	1.6%	17,448	21,143	1.6%	0
SMUD	11,172	13,148	1.4%	11,172	13,148	1.4%	0
LADWP	24,673	26,070	0.5%	24,673	26,070	0.5%	0
NorCal	21,518	23,942	0.9%	21,518	23,942	0.9%	0
SoCal	26,766	29,603	0.8%	26,766	29,603	0.8%	0
WaterAgencies	12,294	12,299	0.0%	12,294	12,299	0.0%	0
California Total	277,479	320,519	1.2%	277,479	320,519	1.2%	0

# Phase 2 – Data Evaluation & Model Development



## Impact on Rates

	PG&E
2008 Rate Level	\$ 0.14
2020 Reference Case	\$ 0.17
2020 User Case	\$ 0.19
% Change 2020 User to Reference	12%
Change 2020 User to Reference	\$ 0.0209
% Change 2008 to 2020 User Case	35%
Change 2008 to 2020 User Case	\$ 0.05
	2.9%

## Total Utility Cost (\$M, 2008 dollars)

	PG&E
2008 Utility Cost	\$ 11,374
2020 Reference Case	\$ 15,922
2020 User Case	\$ 15,734
% Change 2020 User to Reference	-1.2%
% Change 2008 to 2020 User Case	38%
	3.2%

## CO2 Supply Curves

Summary of INCREMENTAL resource CO2, Costs, and GHG Savings. Incremental means those costs and savings that are in addition to the reference case.

	EE
Rounded CO2 Savings	10.2
GWh at Generator	20,528
Peak MW at Generator	3,695
Utility Costs	\$ 800
Utility Energy Value	\$ 1,135
Utility Capacity Value	\$ 372
Utility T&D Value	\$ 336
Utility Energy, Capacity & T&D	\$ 1,843
Customer Costs	\$ 802
Cost \$/tonne	(101.81)

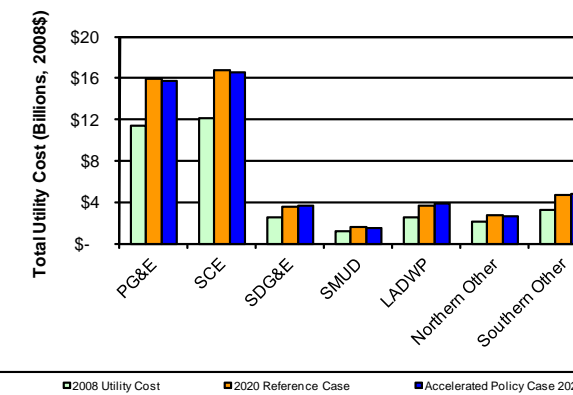
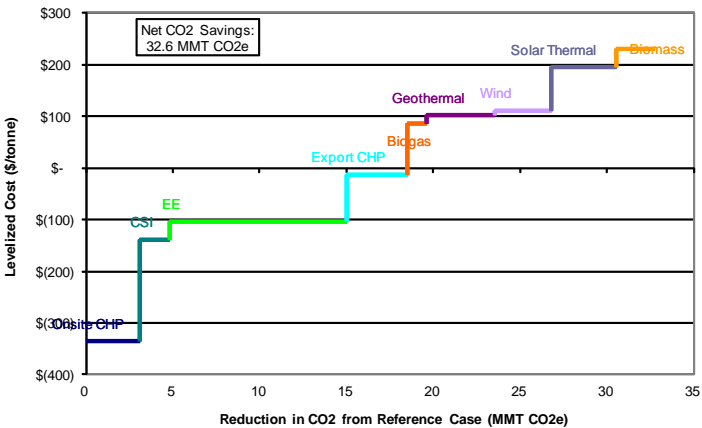
## Summary of Costs per Tonne (\$/Tonne CO2e)

	GHG Savings (MMt CO2e)
Energy Efficiency	10.2
Renewables	14.2
CSI	1.7
CHP	6.6
<b>Total / Weighted Average for Costs</b>	<b>32.7</b>

## Incremental Annual Customer Costs of Resources in

	PG&E
EE	\$ 310
SB1	\$ 996
CHP	\$ -

Note: Non-linear changes in emissions intensities are caused by expiration of LSE coal contracts/ownership shares.



# Phase 3 – Modeling & Deliverables

Use Calculator to Develop Emission Scenarios

- 1990
- Current
- 2020
- 2030
- 2050



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# Phase 3 – Modeling & Deliverables

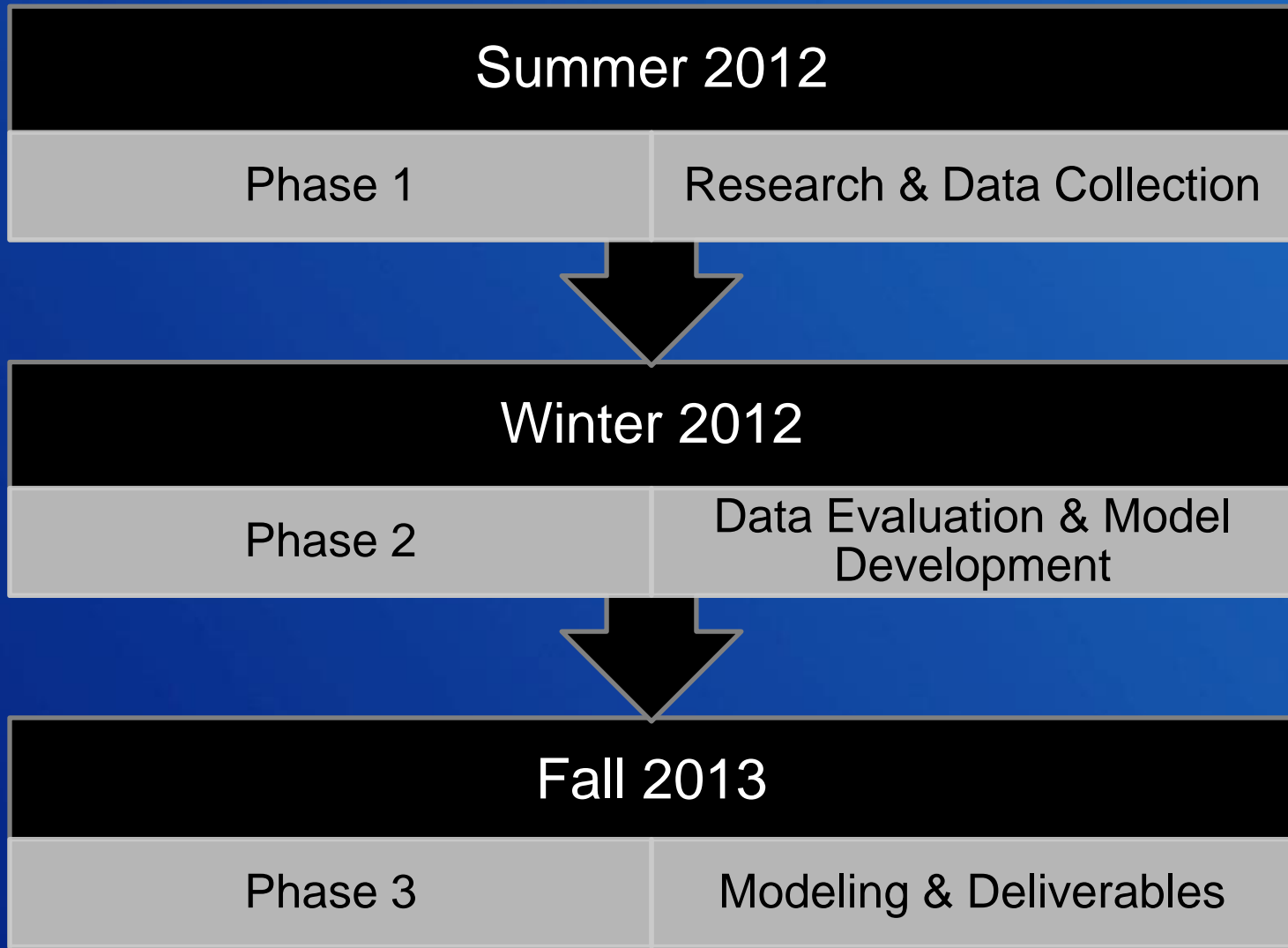
## Develop List of Recommendations

- Bring 2020 GHGE back to 1990 levels
- Bring 2050 GHGE levels 80% below 1990 levels
- Evaluate both supply and demand

# Phase 3 – Modeling & Deliverables

- Deliverables
  - Water Sector GHGE Calculator software
  - Users manual for Water Sector GHGE Calculator
  - Project Report
    - Methods
    - Assumptions
    - Results
    - Recommendations

# GHGE for the Water Sector



Questions?

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