California Agriculture: the Water - Power Connection

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A BRIEF OVERVIEW OF CALIFORNIA

Geography and Land Use

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Groundwater Supply

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Groundwater Supply and Agriculture

Subsidence, as a result of groundwater overdraft, is a major issue for some agricultural areas of the state.

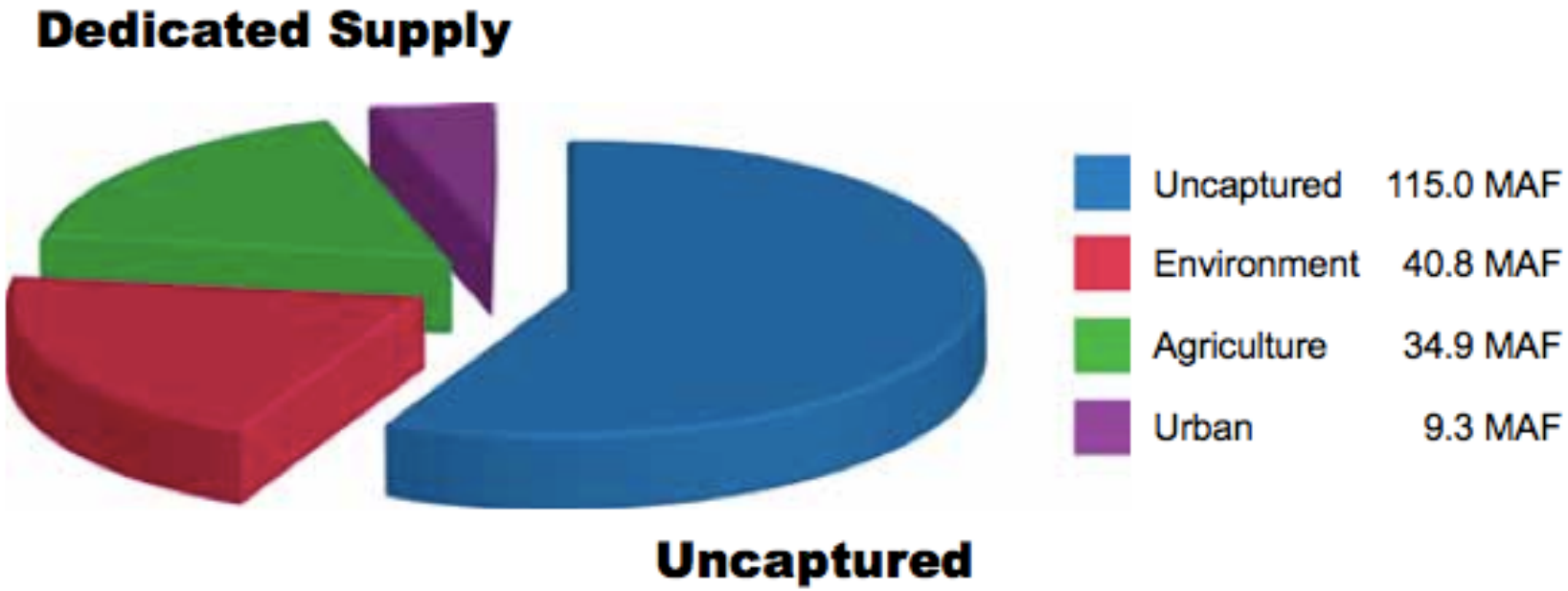
A BRIEF OVERVIEW OF CALIFORNIA

Groundwater, continued.

A BRIEF OVERVIEW OF CALIFORNIA

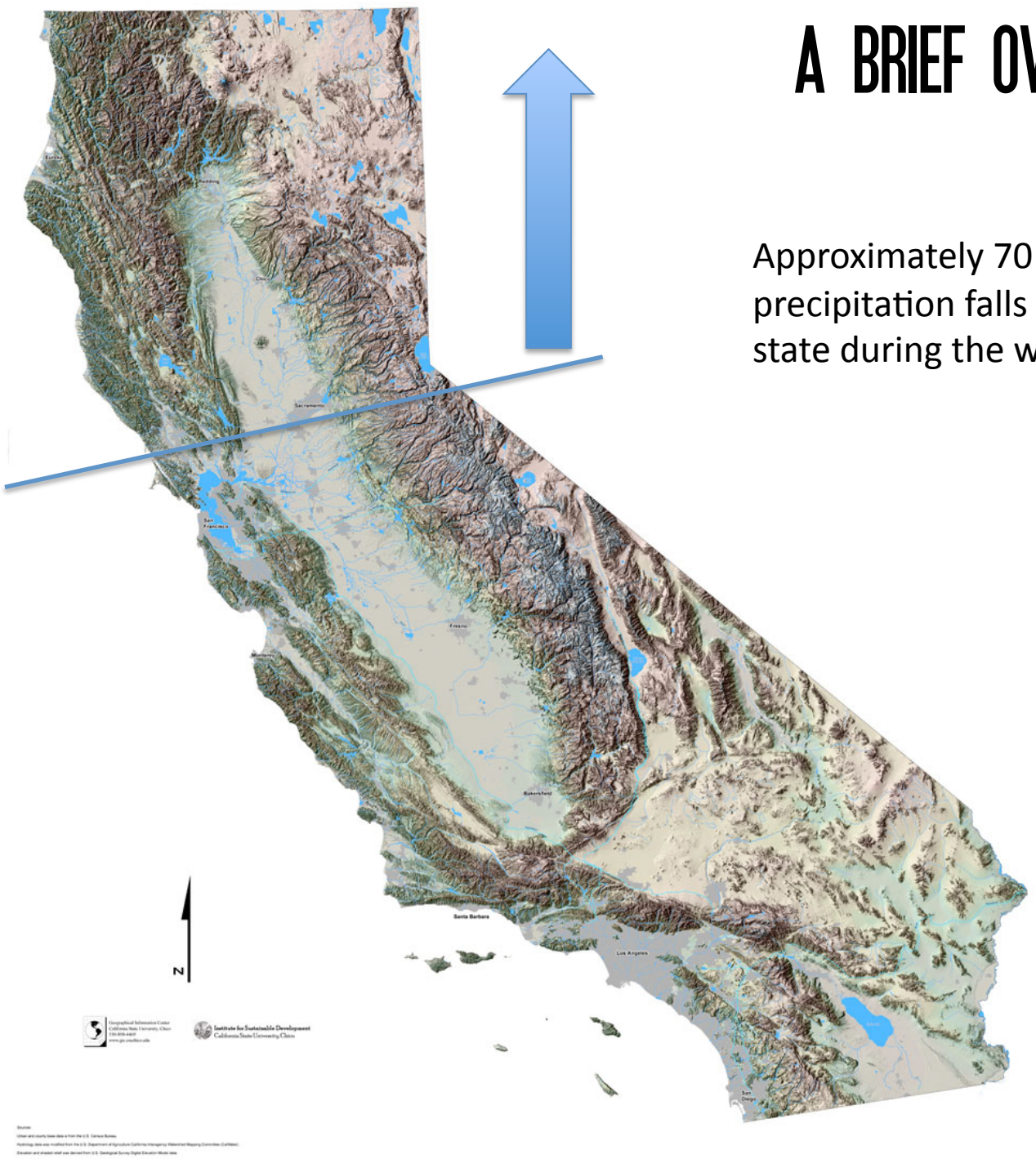
Surface Water Supply and Demand

Approximately 200 million acre feet of surface water are available in a normal precipitation year.



A BRIEF OVERVIEW OF CALIFORNIA

Water Supply and Demand



Approximately 70 percent of California precipitation falls in the northern third of the state during the winter months.

A BRIEF OVERVIEW OF CALIFORNIA

Surface Water Supply

California relies on a complex network of more than 1,200 surface reservoirs to store and meter out water through the months of March-November.

A BRIEF OVERVIEW OF CALIFORNIA

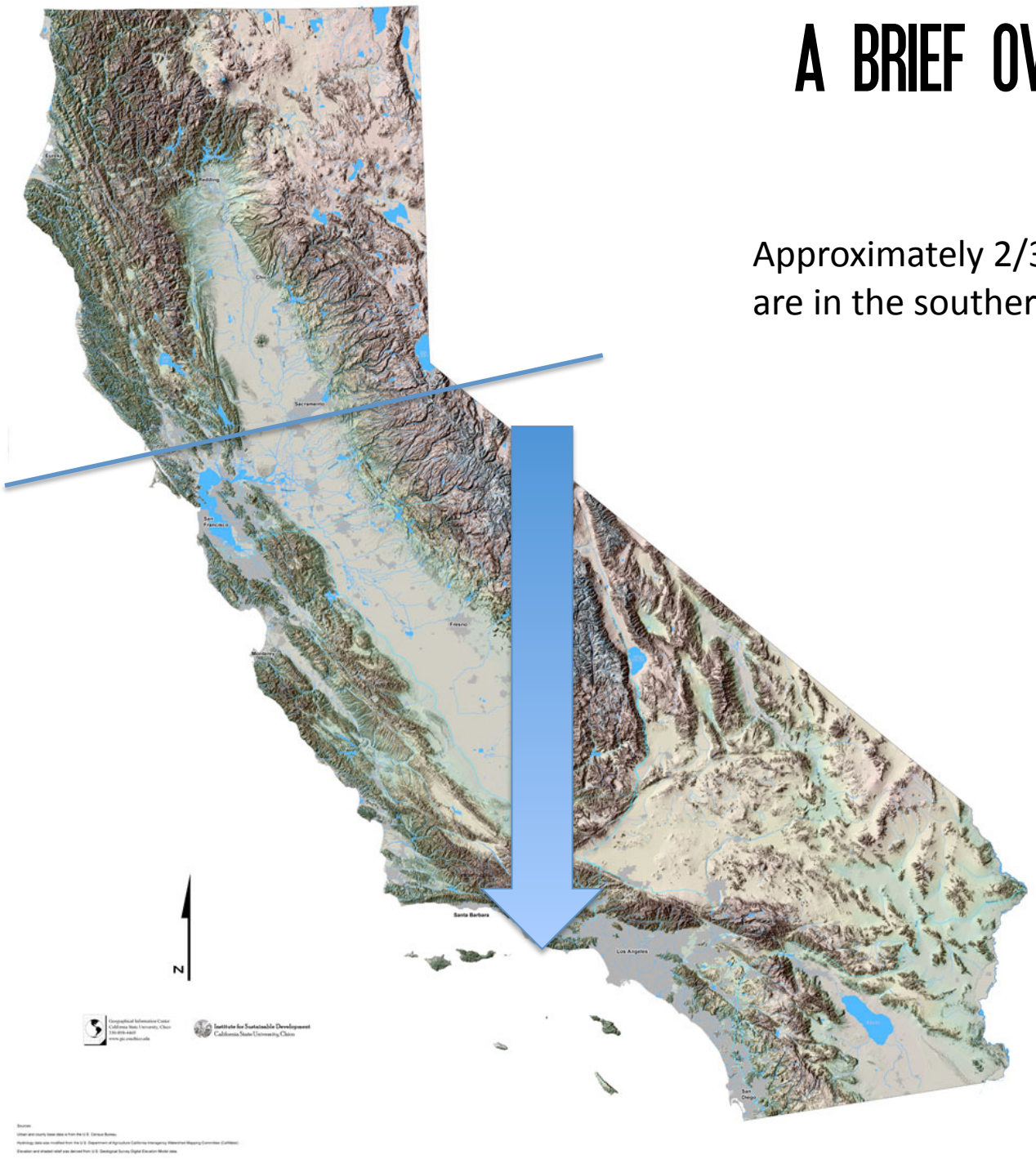
Surface Water Supply

The largest of these reservoirs is the Sierra Snow pack, which provides gradual melt release during the summer months.

A BRIEF OVERVIEW OF CALIFORNIA

Water Demand

Approximately 2/3 of California water needs are in the southern half of the state



MOVING WATER

MOVING WATER

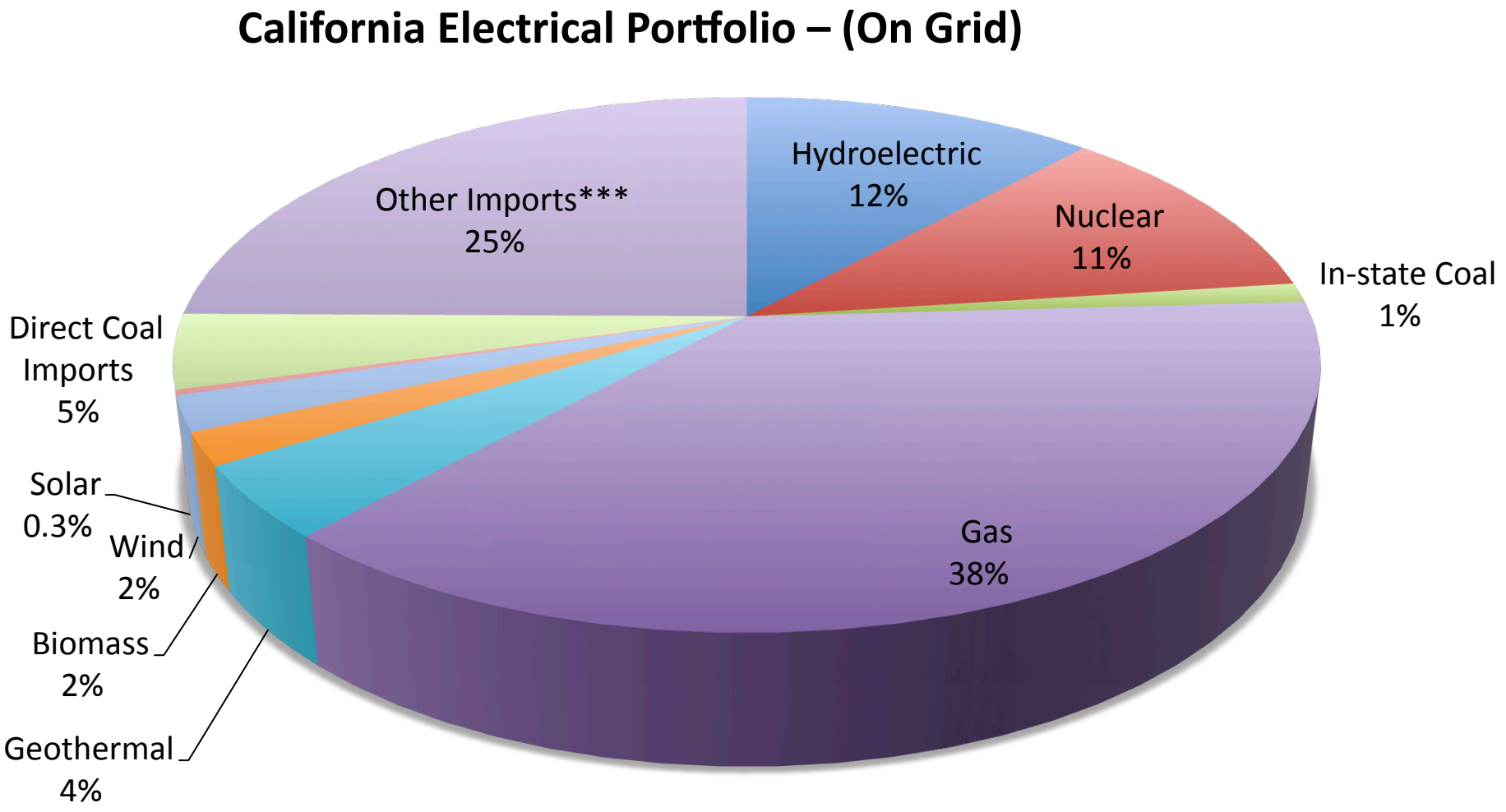
MOVING WATER

A BRIEF OVERVIEW OF CALIFORNIA

Enough Already!- What about Electricity?

CALIFORNIA ELECTRICITY

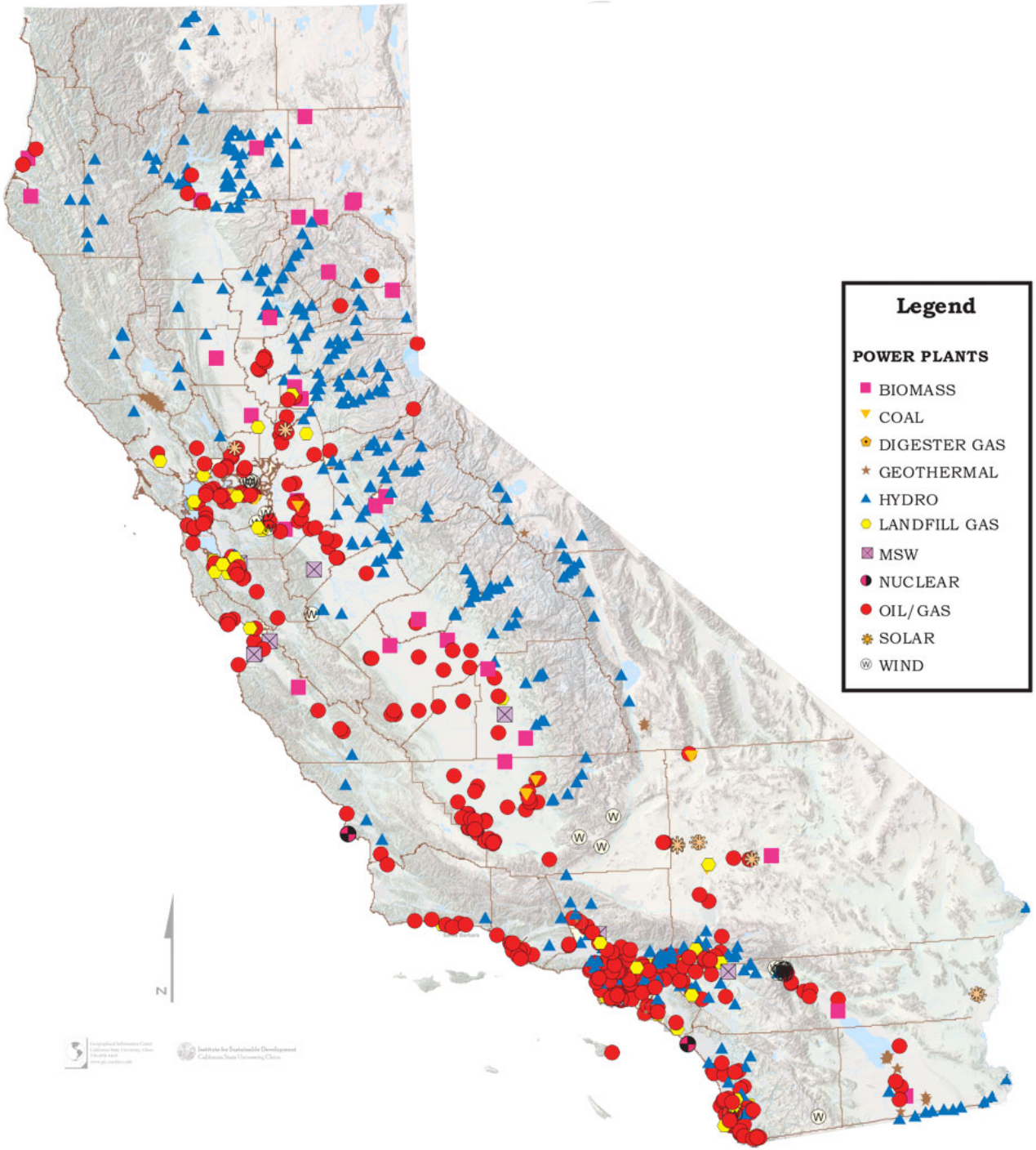
Electrical Generation



*** We have only a vague notion how this energy is being produced- but we're working on it.

CALIFORNIA ELECTRICITY

Electrical Generation



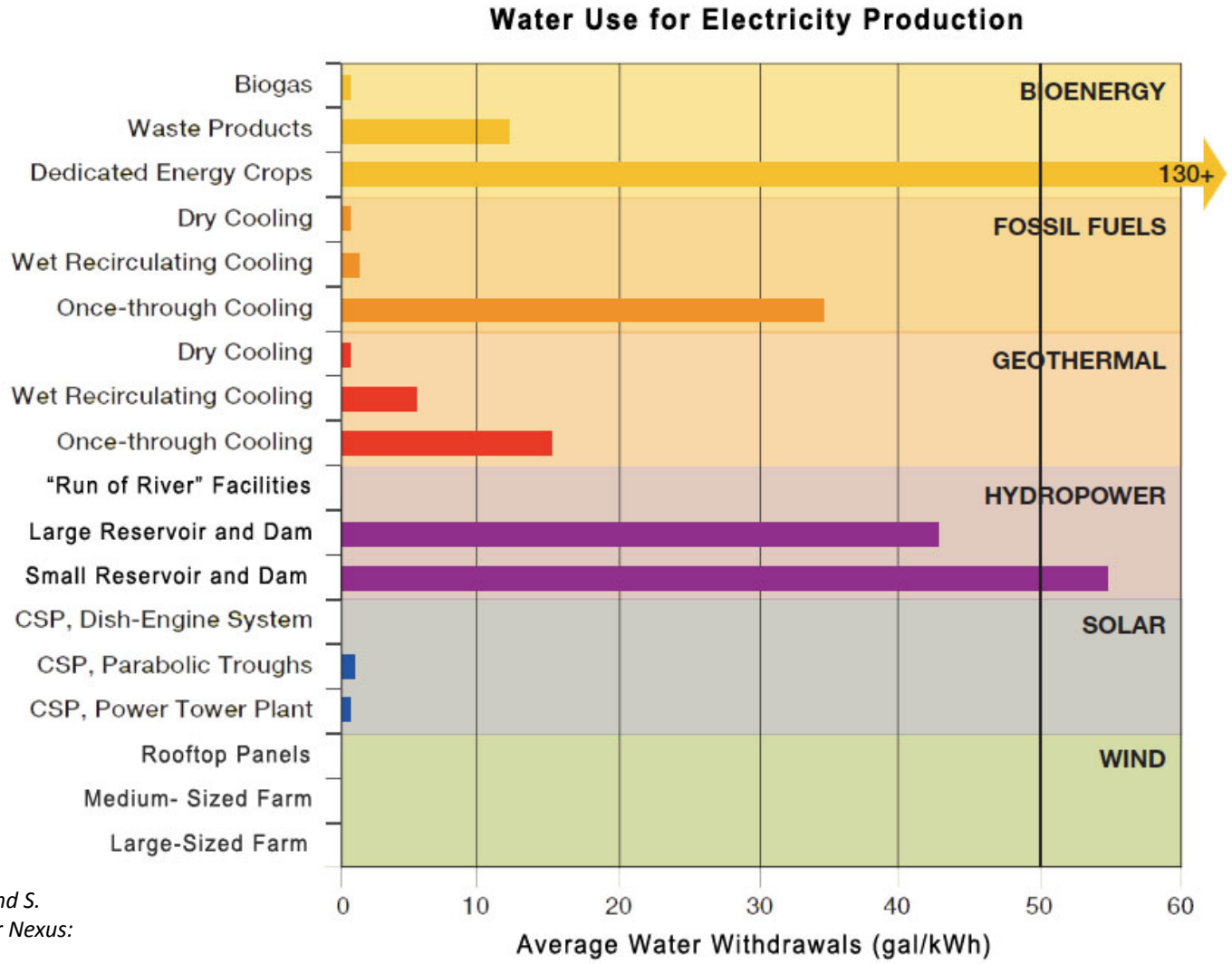
WATER USE FOR ELECTRICAL IN CA

Energy Production and water “use”

Water use for energy production

How can we optimize water use in electrical production?

Are there ways to derive multiple benefits?



Graph: *Dennen, A., D. Larson, C. Lee, J. Lee, and S. Tellinghuisen, 2007. California’s Energy-Water Nexus: Water Use in Electricity Generation.*

ELECTRICAL USE AND WATER IN CA

The big picture

It’s complicated...

ELECTRICAL USE AND WATER IN CA

The big picture

Water-related energy use (2005)

	Electricity (GWh) WER Table 1-1
Water Supply and Treatment	
Urban	7,583
Agricultural	2,788
Water End Uses	
Agricultural	7,372
Residential	28,258
Commercial	
Industrial	
Wastewater Treatment	2,012
Total Water-Related Energy Use[7]	**48,013**
Total California Energy Use	**250,494**
Percent	**19.2%**

Graph: California Energy Commission

CALIFORNIA AG WATER ENERGY USE

Energy Use and Agricultural Water

Table 1-4: Energy Consumed in Agriculture for Water

Category	Energy Consumption (GWh)
Conveyance to Irrigation Districts by the State and Federal water projects	1,720
Conveyance to Irrigation Districts by the Western Area Power Administration	400
Irrigation District surface water pumping	822
Irrigation District ground water pumping	246
On-farm ground water pumping	4,499
On-farm booster pumping	2,873
Subtotal	10,560
Electric equivalent for diesel and natural gas engine driven water pumping	1,231
Total	11,791

Graph: Irrigation Training and Research Center

ELECTRICAL USE AND WATER IN CA

Part of the Story

"California's single biggest user of electricity is the State Water Project"

"The California State Water Project consumes 5.1 billion kWh."

From: "The Energy-Water Collision: 10 Things You Should Know"
By: Union of Concerned Scientists

ELECTRICAL USE AND WATER IN CA

The Rest of that Story

"California's single biggest user of electricity is the State Water Project"

"The California State Water Project consumes 5.1 billion kWh."

The State Water Project (SWP) ***IS*** the single largest consumer of electricity in the state, consuming about 5.1 billion kilowatt hours annually.

It also **produces between 6.5 and 8.57 billion kilowatt hours annually**; mostly through hydroelectric plants on the system.

ELECTRICAL USE AND WATER IN CA

Electrical Use On-Farm

Energy Consumed in Agriculture for Water

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CALIFORNIA TRENDS

Factors to Consider: Water Use Efficiency

-University research indicates that as farmers improve their irrigation management, specific high acreage crops (almonds, alfalfa) have actually been under-irrigated.

-Irrigation application methods are changing. Efforts to improve water use efficiency is causing a trend away from gravity-driven irrigation methods such as basin and furrow toward filtration and pressure-dependant microdrip and sprinkler systems

CALIFORNIA TRENDS

Factors to Consider: Other Pressures

-Air Quality Regulations- California's stringent air quality regulations will necessitate a move away from diesel and gasoline operated engines.

-Water Quality Discharge Regulations- California's efforts to heighten control over groundwater may require collection of tailwater at the field and farm level.

-Surface Water Supply Instability- Due to variability in surface water supplies, growers will expand groundwater pumping to provide the water needed for high-cost permanent plantings (grapes, almonds, walnuts, etc.)

CALIFORNIA ON-FARM ENERGY PROGRAMS

APEP – Agricultural Pump Efficiency Program

Run by the California State University, focused on improving grower extraction and booster pumps

Also provides grower education on testing, improving irrigation efficiency

TOU – Time of Use Programs

Operated by the largest electrical utilities, designed to shift use to off-peak times

GOT QUESTIONS?