Economic Modeling Technical Stakeholder Meeting
February 29, 2008

ENERGY 2020 Model
Inputs and Assumptions Book

- The Inputs and Assumptions Book details the assumptions and data inputs that are used in the development of the Reference Case.
- The Inputs and Assumptions Book should be viewed as a living document that will evolve as the model is reviewed and refined.

ENERGY 2020 Model
Inputs and Assumptions Book

- Analytic Approach
- Reference Case Inputs
- Description of the Energy 2020 Model

Sources for Key Inputs for Reference Case

Input Category	California	Rest of the West
Population and Economic	Census EDRAM	Census EIA, BEA
Fuel Prices	CA state sources E3 for electric sector EIA for other	EIA
Energy Use and Consumption	ARB GHG Inventory	EIA State Energy Consumption, Price, and Expenditure Estimates (SEDS)
Emissions and Air Regulations	ARB GHG Inventory	EPA
Electricity Generation Capacity and Operational	EPA NEEDS database (To be compared with WECC database used by E3)	

Energy 2020

ENERGY 2020 is an integrated multi-region, multi-sector energy analysis system that simulates the supply, demand and price for all fuels.

- Dynamically describes the behavior of both energy suppliers and consumers for all fuels and for all end-uses.
- Simulates the physical and economic flows of energy users and suppliers.
- Simulates how energy users and suppliers make decisions and how those decisions causally translate to energy-use and emissions.

Energy Demand

- **Capital Formation**
  - Energy is a derived demand
- **Fuel and Technology Market Shares**
  - Represents fuel and efficiency level decisions
- **Stock and Flow Accounting**
  - Capital and Energy Stock by Vintage
- **Energy requirements converted into energy demand**
  - Utilization of Capital and Energy Stock

Energy Demand

Detailed model of sectors

- Residential – 3 structure types
- Commercial – 14 sub-sectors
- Industrial – 39 sub-sectors
- Transportation – passenger, freight & off-road

End Uses

- Specific to each sector
- Separates “substitutable” loads (multiple fuel choices) from “non-substitutable” (electric only).
- Transportation divided into 7 “modes” as well as by vehicle classes within passenger and freight.

Electricity Supply

- **Functional Divisions**
  - Distribution
  - Transmission
  - Marketing
  - Generation
- **Capacity Expansion**
  - developed endogenously
  - committed capacity specified exogenously
- **Generation and Fuel Use**
- **Electricity Prices**
- **Emissions**

Other Supplies

- Oil production *(6 sub-sectors including non-conventional)*
- Gas production
- Coal Mining
- Combined Heat & Power & Steam Production
- Ethanol Production
- Renewables
- Extensive choice of fuel types *(33 fuels/sources modeled)*

Model Outputs- Emissions

- Combustion – by fuel, end-use, and sector
- Non-combustion - by economic activity
- Non-energy - by economic activity

SO_2	NO_2	N_2O	CO	CO_2
CH_4	PMT	PM2.5	PM5	PM10
VOC	CF_4	C_2F_6	SF_6	HFC

Model Outputs-Electric Summary

Generation by Plant Type (GWh/year)	Peak Loads (MW)
Generation by Primary Fuel (GWh/year)	Reserve Margin (%)
Industrial Generation (GWh/year)	Electric Prices (fixed $/MWh)
Generating Capacity by Plant Type (MW)	Wholesale Electricity Price (fixed $/MWh)
Generating Capacity by Primary Fuel (MW)	Generation Capacity for Comparison with EIA (MW)
Industrial Generating Capacity (MW)	Generation for Comparison with EIA (GWh)
Energy Demands by Plant Type (TBtu/year)	Renewable Generation by Plant Type
Energy Demands by Primary Fuel (TBtu/year)	Emergency Generation (GWh)
Industrial Generation Energy Demand (TBtu)	Wholesale price for Node – Summer (fixed $/MWh)
Energy Sales (GWh/year)	Wholesale price for Node – Winter (fixed $/MWh)
Transmission Flows (GWh/year)	

Model Output-Economic Drivers

Gross Regional Product (Billions of $/year)
Personal Income (Billions of $/year)
Population (Millions)
World Oil Price (fixed $/mmBtu)
Natural Gas Wellhead Price ($/mmBtu)
Households (Thousands)
Personal Income per person ($/person)
People per household
Distance Travelled (millions VMT)
Distance Travelled (Miles/Person)

Model Output-End Use Summary

Energy Demand (TBtu/Year)
Marginal Device Efficiency (Btu/Btu)
Average Device Efficiency (Btu/Btu)
Process Efficiency ($/TBtu)
Lifestyle Multiplier (Btu/Btu)
Capacity Utilization Factor ($/Yr/$/Yr)

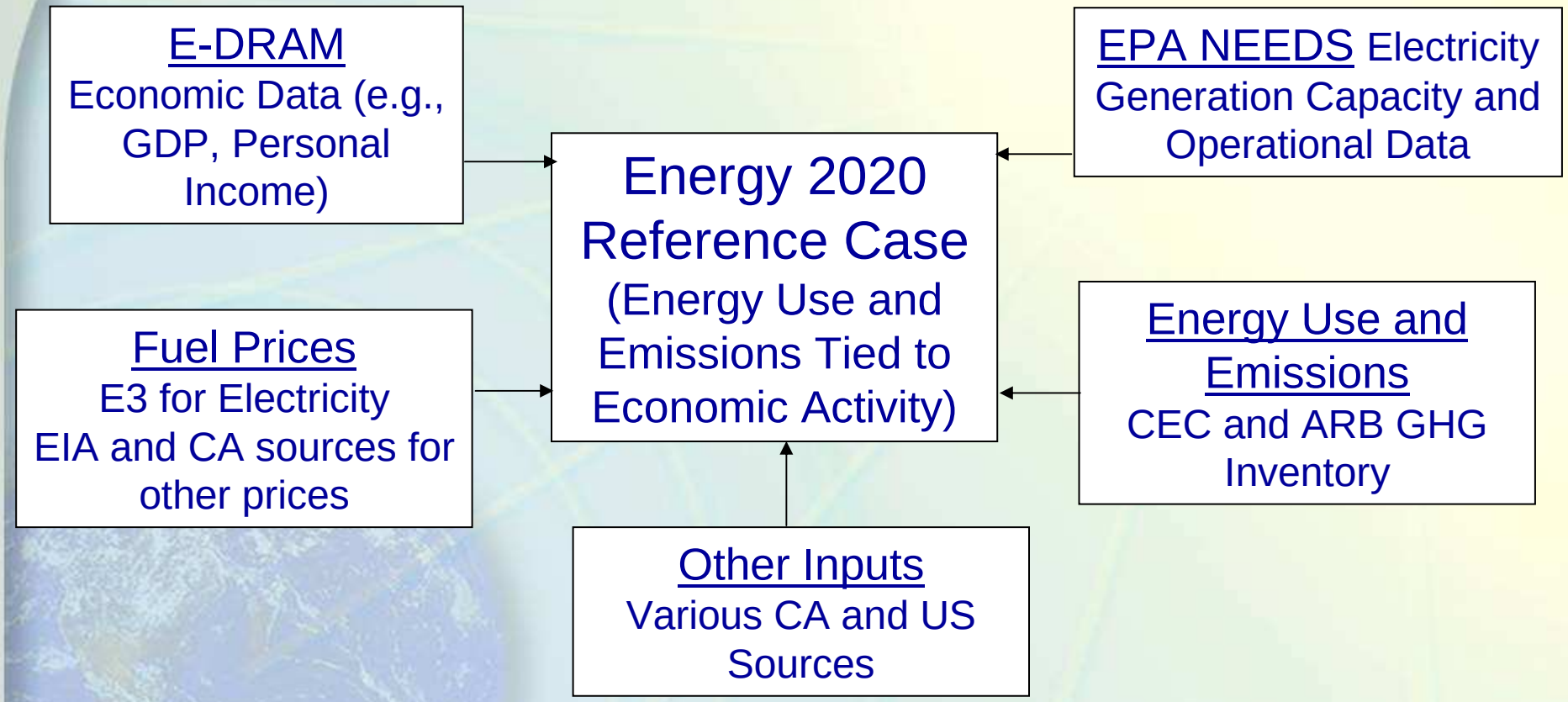
Model Output-Transportation Technology

Passenger Total Energy Demand (tBtu/year)
Freight Total Energy Demand (tBtu/year)
Off Road Total Energy Demand (tBtu/year)
Passenger Device Efficiency (Mile/mmBtu)
Freight Device Efficiency (Mile/mmBtu)
Off Road Device Efficiency (Mile/mmBtu)
Passenger Average Device Efficiency (Mile/mmBtu)
Freight Average Device Efficiency (Mile/mmBtu)
Off Road Average Device Efficiency (Mile/mmBtu)
Passenger Process Energy Requirements (million miles per year)
Freight Process Energy Requirements (million miles per year)
Off Road Process Energy Requirements (million miles per year)

Model Output- Prices

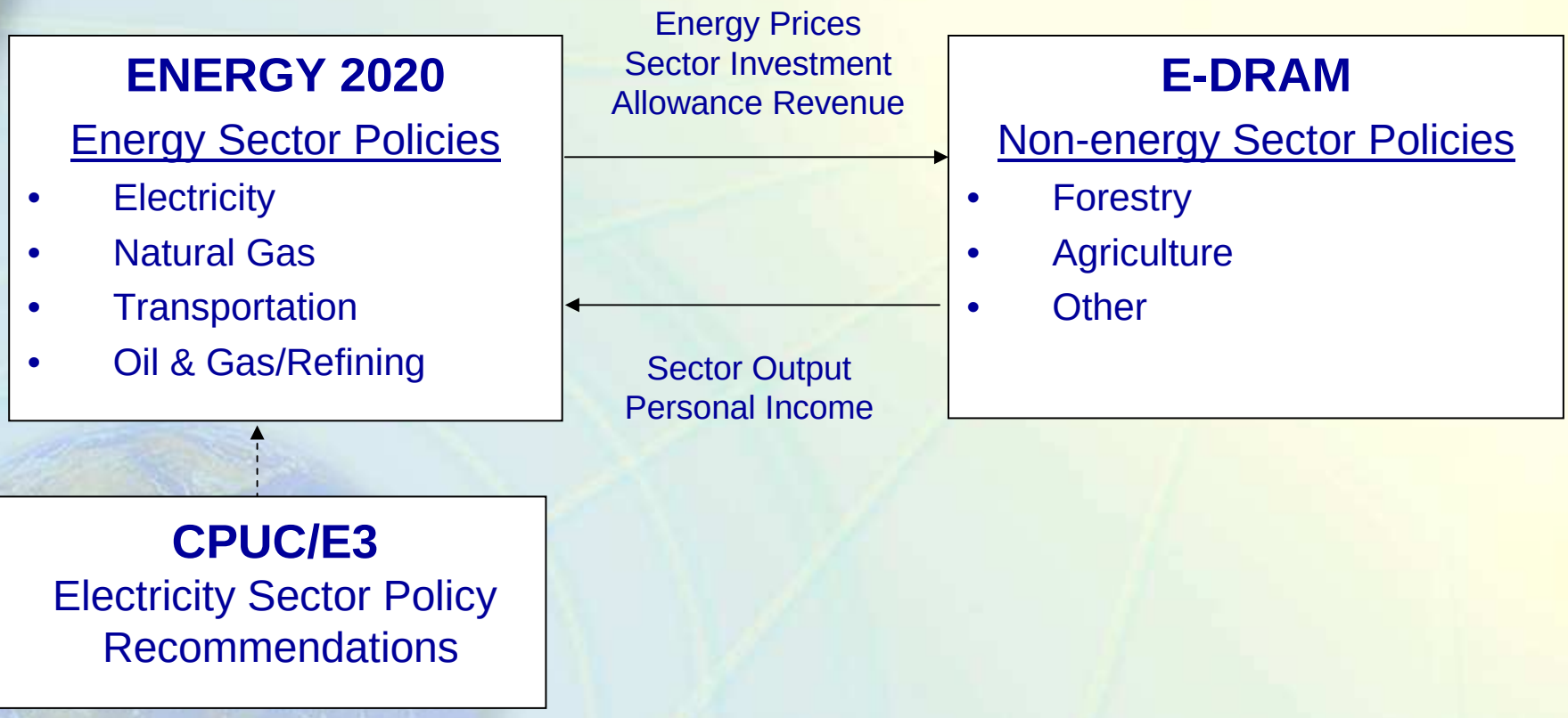
Average Price of Electricity ($ /MWh) by Transmission, Distribution, Marketer and Total
Average prices for other energy forms by sector ($/mmBtu)

Energy 2020 Reference Case for California



Data for other Western States are from EIA, BEA and USEPA

Policy Analysis



All policy runs are compared to the established BAU case