

GLIMPSE:

An integrated assessment model-based tool for
coordinated energy and environmental planning

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State Energy and Air Quality Group Webinar Series, June 8th, 2017

Foreword

- Objective of this presentation
 - Introduce the GLIMPSE project and demonstrate its use
 - The demo will walk through an application, giving a sense of both user-friendliness and capabilities
- Intended audience
 - State modelers and analysts interested in tools for facilitating long-term energy and air quality planning
- Additional contributors
 - EPA: Chris Nolte, Tai Wu, and Carol Lenox
 - ORISE participants and fellows: Wenjing Shi, Yang Ou, Samaneh Babaei, and Troy Hottle
- Disclaimers
 - While this material has been cleared for presentation, it does not necessarily reflect the views or policy of the U.S. EPA
 - Results are provided for illustrative purposes only

Abbreviations

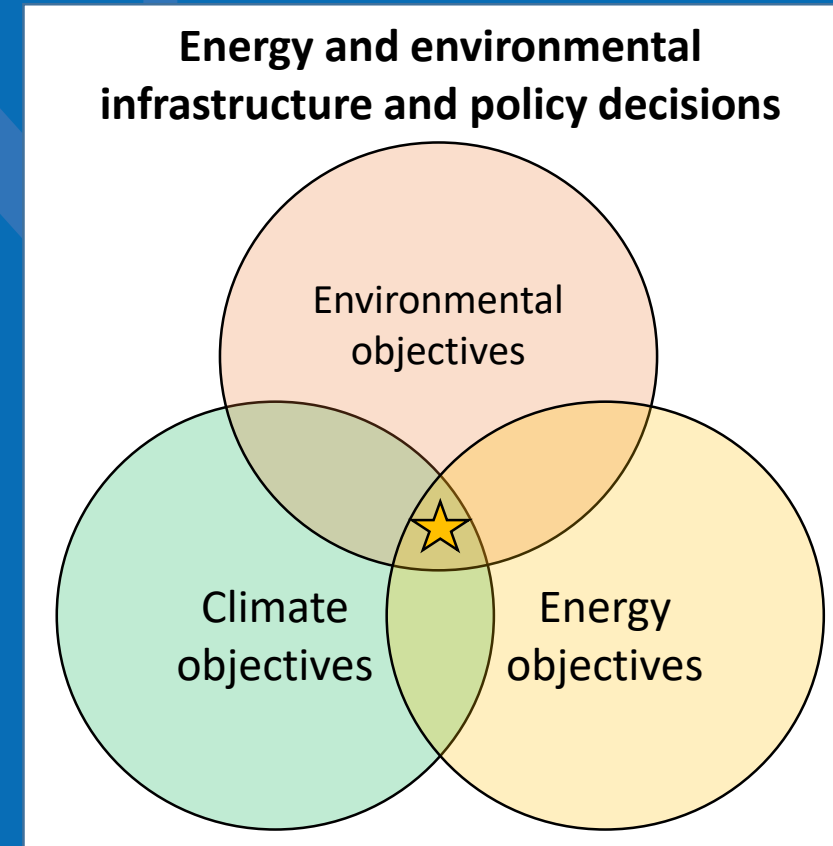
- Greenhouse gases
 - CO₂ – carbon dioxide
 - CH₄ – methane
- Traditional air pollutants
 - NO_x – nitrogen oxides
 - SO₂ – sulfur dioxide
 - CO – carbon monoxide
 - PM – particulate matter
 - PM_{2.5} – PM with a diameter less than 2.5 microns
 - O₃ - ozone
- Policies and regulations
 - CAFE – Corporate Vehicle Efficiency Standard
 - CSAPR – Cross-State Air Pollution Rule
 - RES – Renewable Electricity Standard
- Modeling
 - IAM – Integrated Assessment Model
 - GCAM – Global Change Assessment Model
 - MOVES – MOBILE Vehicle Emissions Simulator
 - IPM – Integrated Planning Model
 - NONROAD – Nonroad mobile source model
- Energy and technologies
 - EGU – Electricity generating unit
 - NG – natural gas
 - BEV – battery electric vehicle
 - FCEV – fuel cell electric vehicle
 - PV - photovoltaic

Outline

- GLIMPSE project objectives
- Background: GCAM and GCAM-USA
- GLIMPSE activities
- Demonstration
- Next steps

GLIMPSE project objectives

- Develop model-based tools for long-term environmental and energy planning
 - Evaluate scenarios (exploring assumptions: technology, policy, socio-economic, ...)
 - Understand tradeoffs among policy options
 - Identify cost-effective, robust management strategies
- Support decisions at various geo-political scales
 - National
 - Regional
 - State
- Desired attributes
 - Low-cost or free, open source
 - Easy to use
 - Executes on desktop computer
 - Relatively quick

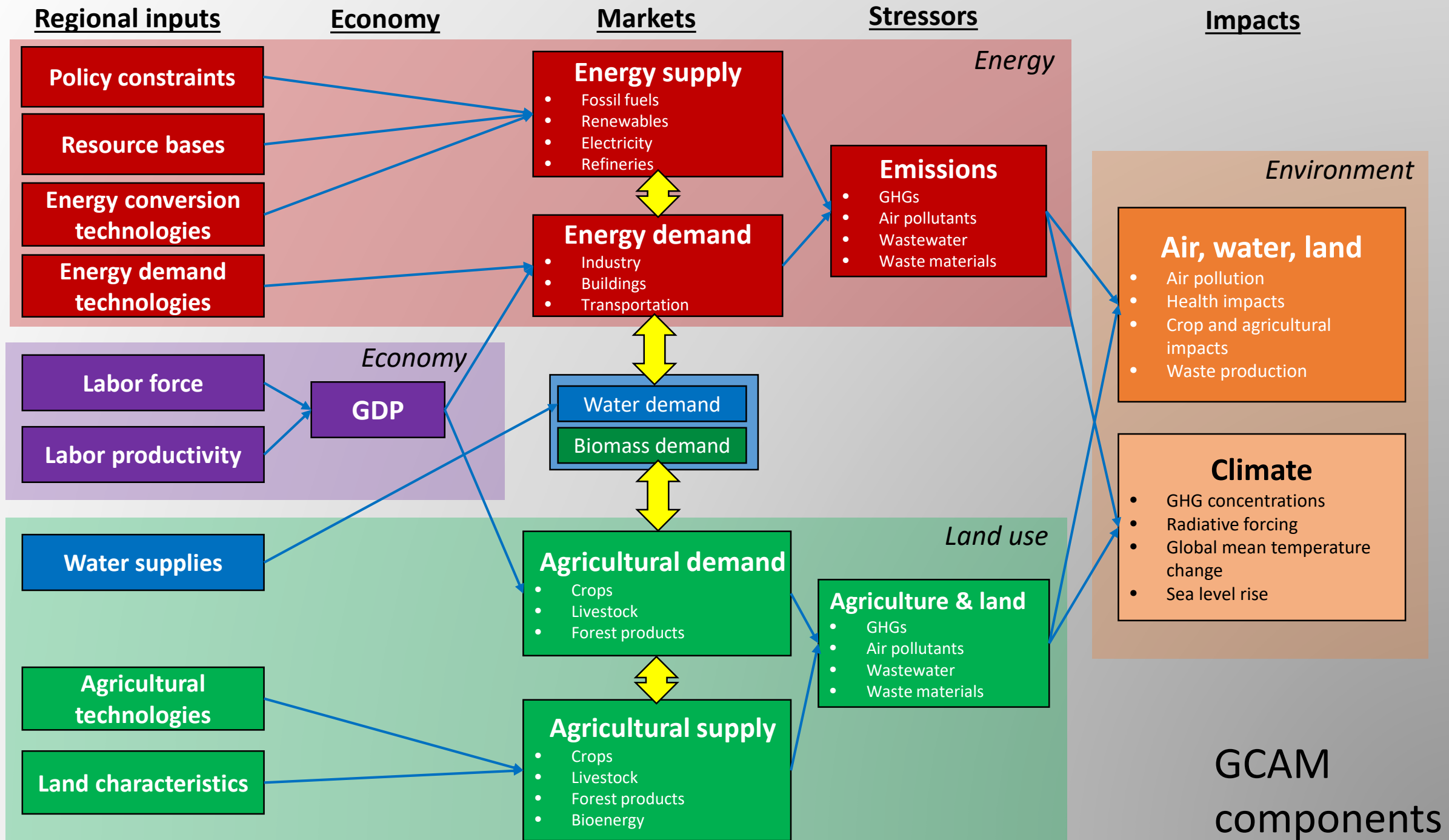


Background

- Several years ago, we learned about PNNL's development of GCAM-USA, a state-level variant of the Global Change Assessment Model (GCAM)
- GCAM:
 - A technology-rich Integrated Assessment Model (IAM)
 - IAMs simulate interactions among human and earth systems
 - Major systems represented in GCAM:



- 30 years of applications, predominantly related to climate change mitigation
- Estimates greenhouse gas (GHG) emissions, but also NO_x, SO₂, CO, PM, NH₃ and other air pollutants
- Global coverage, 32 regions; Time horizon of 2010-2100 in 5 yr steps
- Public domain, open source, requires no proprietary software to run, free
- Runtime of <<1 hour on a typical desktop computer

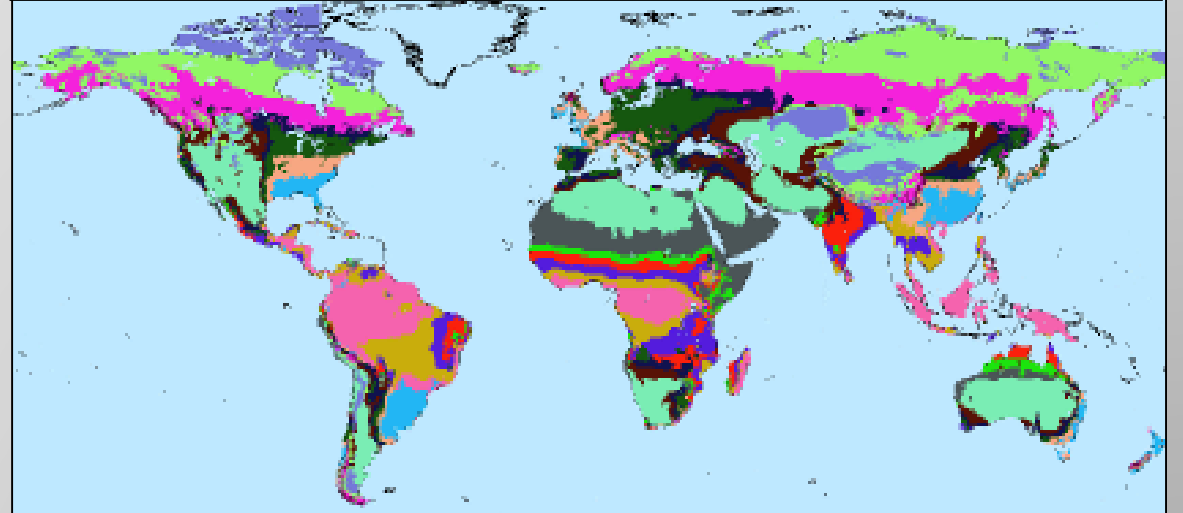


Temporal and spatial resolution

32 economic and energy regions



283 agriculture and land use regions



233 water basins

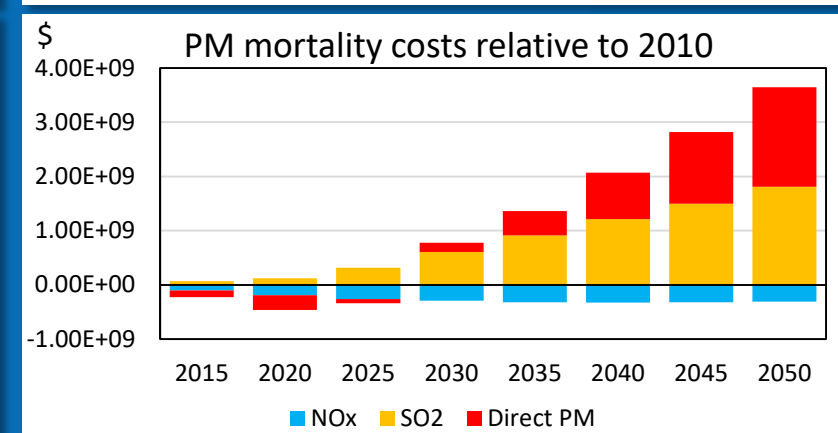
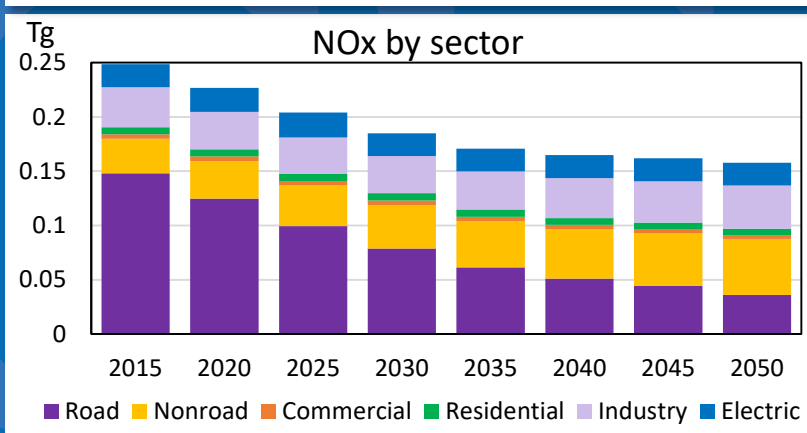
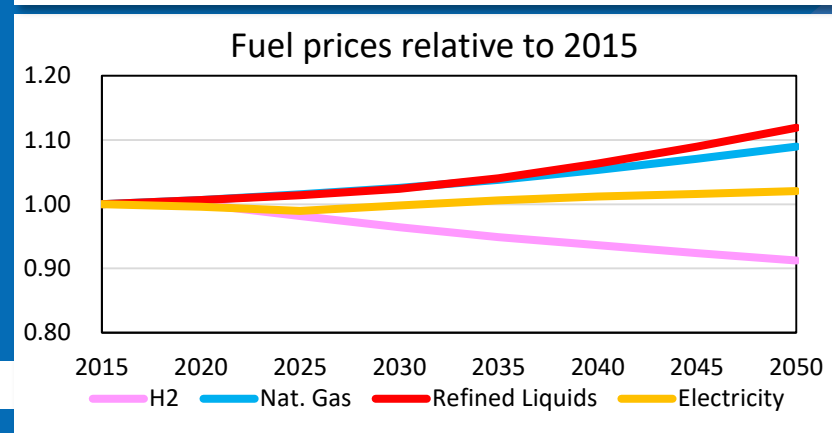
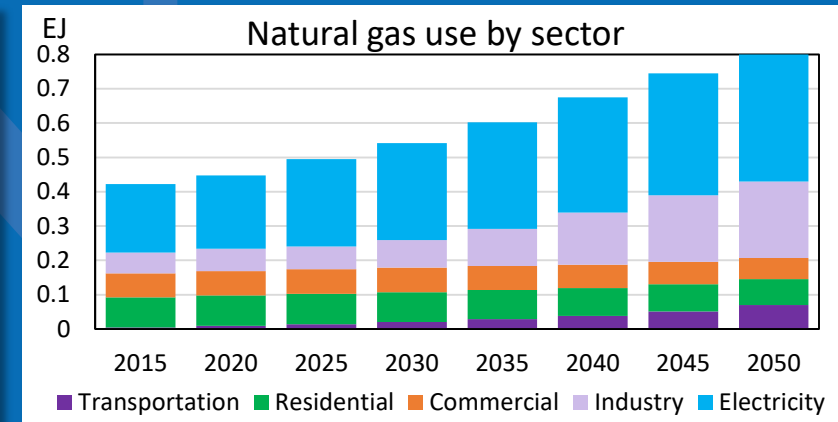
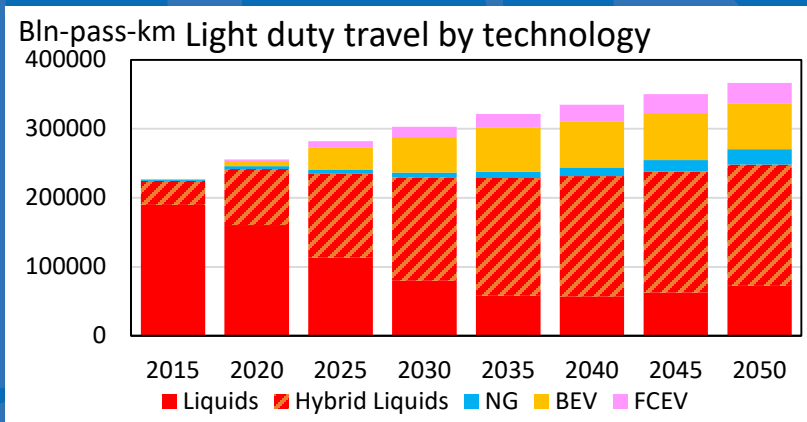
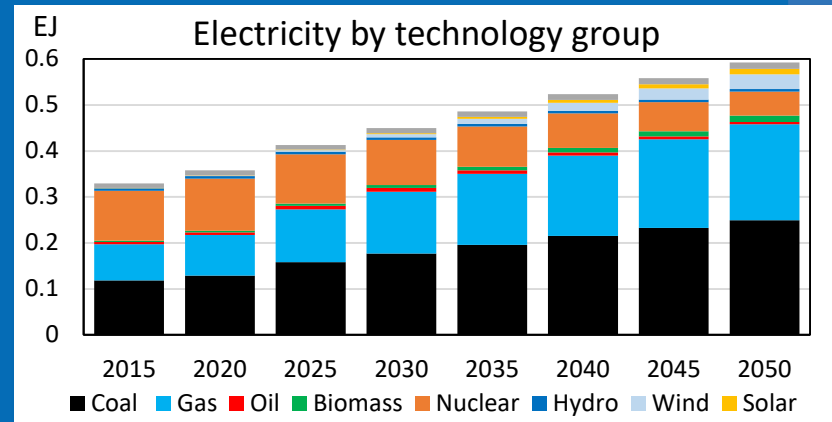


1990 to 2100
5-yr time steps

Background, cont'd

- GCAM-USA:
 - Shares the same code as GCAM
 - Energy system represented at the state level

Example state-level outputs for a scenario of the future (these are for Virginia):



Questions addressed by GCAM-USA

- How would these outputs change if a state, region or the US ...
 - incentivizes vehicle electrification or increases CAFE targets?
 - adopts new biofuel targets?
 - implements a new renewable electricity standard (RES)?
 - sets a target CO₂ reduction goal?
 - implements energy efficiency measures?
- Other things that could be examined include:
 - which technological pathways cost-effectively meet multi-pollutant goals
 - whether or not existing coal and nuclear plant lifetimes are extended
 - implications of wide-spread adoption of advanced technologies
 - effects of drastically lower costs for solar PV, wind, stationary battery storage, or electric vehicles.

GLIMPSE activities

GCAM-USA

Improvements to model

Regulatory representations

- CSAPR
- CAFE
- State-level RES

Emission factors from
MOVES, IPM, NONROAD

Partnering with others

EPA program office beta-testers
of graphical interface

Beginning collaboration with
EPA Region 1 to explore
regional application:

- pathways for meeting state-level air
quality, energy and climate targets

Graphical interface

Developed “Scenario Builder”
to facilitate running the model
and managing results

Modifying existing output tools
for visualizing and analyzing
results

Applications

Effects of alternative population
growth and migration patterns
on energy and emissions

Health effects of alternative
energy pathways

Technology assessment

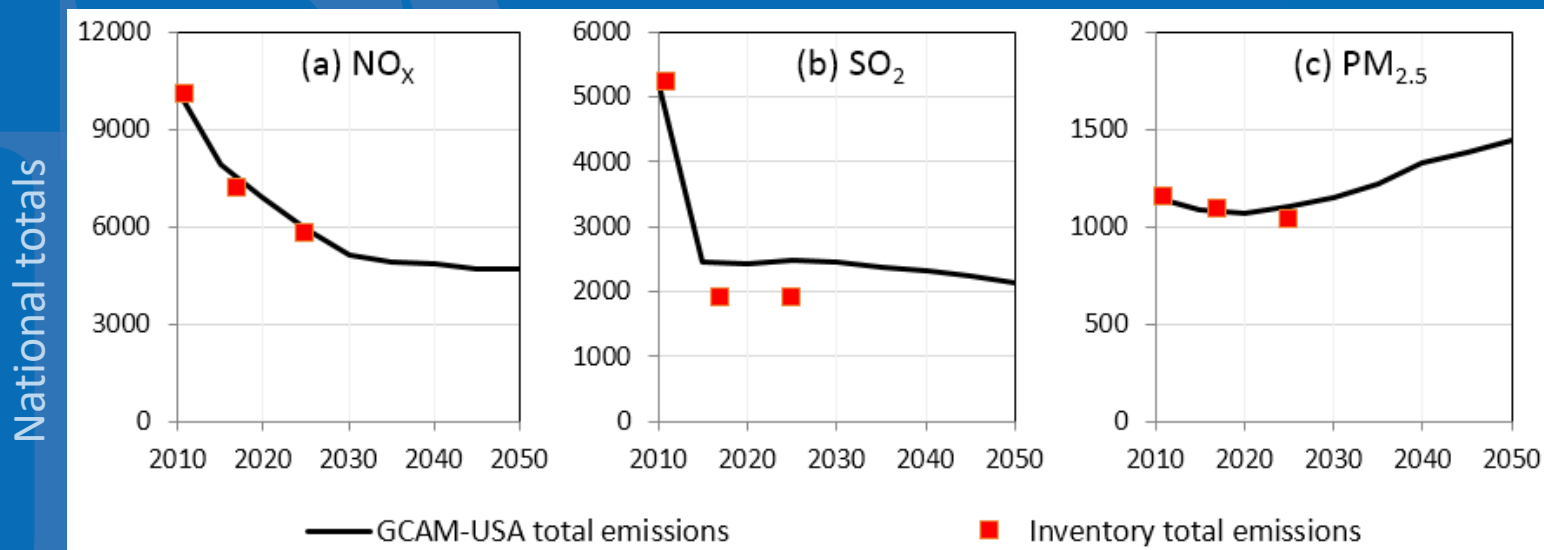
Other activities

Model evaluation: Comparing
national-, state-, and sector-level
emission outputs with the NEI and
EPA projections

Adding impact factors: PM
mortality costs, O₃ damage to
timber and crops, N deposition

Comparison of GCAM-USA emission outputs and EPA inventories

National totals by pollutant



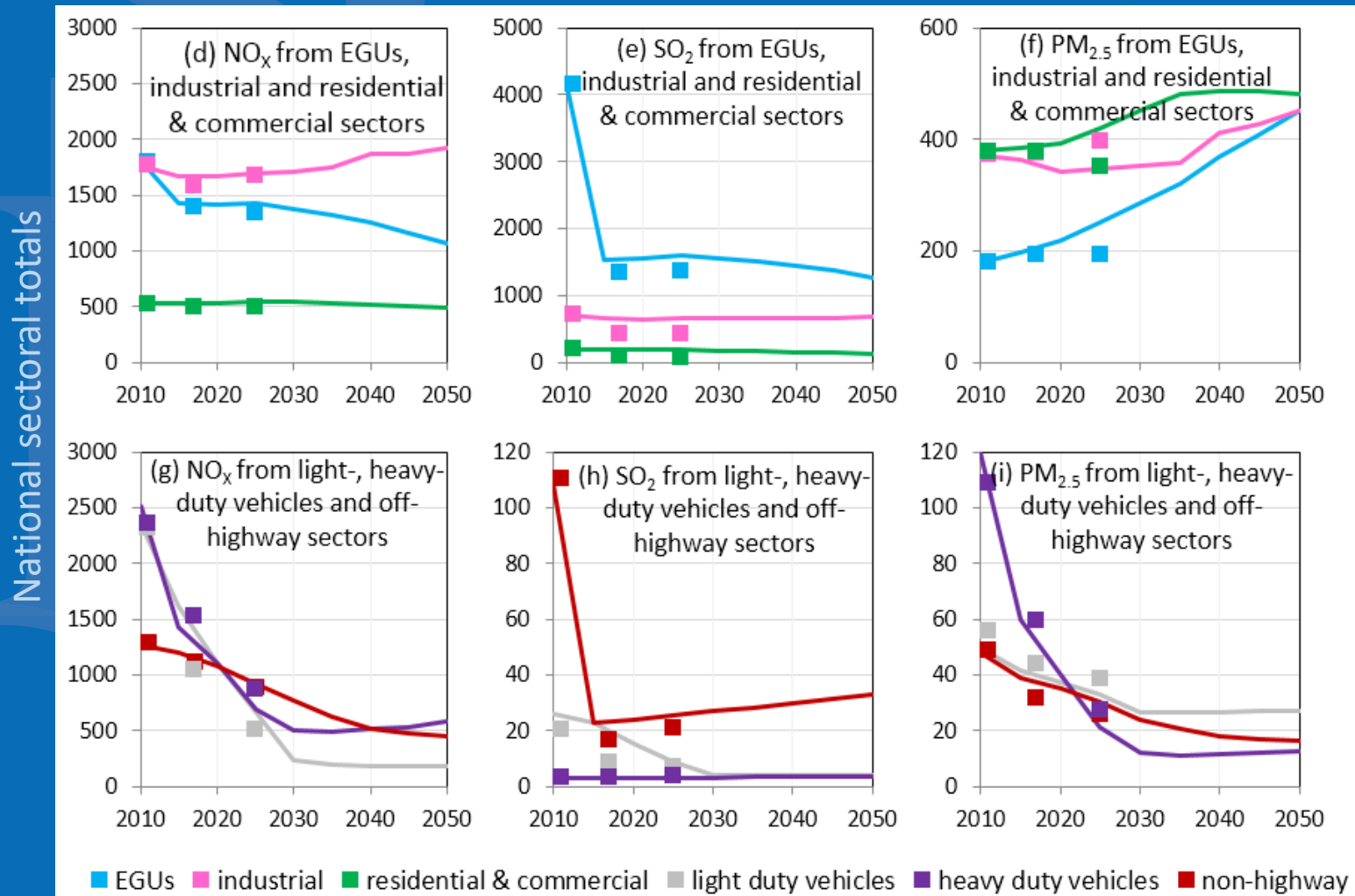
GCAM-USA: Solid lines
EPA inventories: Dots

Validation

Comparison of GCAM-USA emission outputs and EPA inventories

GCAM-USA: Solid lines
EPA inventories: Dots

National totals by pollutant and sector



Projecting emissions

2010 to 2050 emissions growth and control factors for NO_x

GCAM-USA results can be processed to produce state-, pollutant-, source-category specific growth factors suitable for air quality modeling.

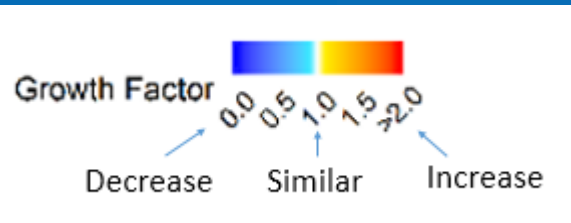
Here, we compare Reference Case factors with those of an alternative energy scenario.

		Reference Case			Alternative scenario		
Sector	Fuel	CA	OH	TX	CA	OH	TX
Electric	Biomass	0.32	6.69	0.57	0.41	5.47	0.83
	Coal	0.20	0.43	0.33	0.17	0.35	0.32
	Gas	1.54	0.50	0.57	1.50	0.83	0.58
	Oil	1.33	1.15	1.03	1.13	0.83	1.00
Industrial	Coal	1.39	1.08	2.61	0.86	0.67	1.28
	Gas	1.15	0.83	1.61	1.04	0.81	1.42
	Oil	0.79	0.52	1.47	0.72	0.50	0.96
	Refineries	0.54	0.54	0.53	0.53	0.53	0.52
Commercial	Biomass	1.39	0.80	1.67	1.24	0.73	1.47
	Gas	1.44	0.70	1.44	1.39	0.69	1.38
	Oil	1.26	0.67	1.47	1.18	0.64	1.38
Residential	Gas	1.33	0.79	1.35	1.29	0.77	1.30
	Oil	1.61	0.88	1.73	1.54	0.85	1.64
	Wood	1.31	0.99	1.74	1.14	0.88	1.50
Mobile	LDV	0.06	0.04	0.06	0.06	0.04	0.06
	HDV	0.26	0.22	0.33	0.26	0.22	0.33
	Aircraft	1.31	0.63	1.37	1.28	0.62	1.34
	Marine & rail	1.03	0.22	0.60	0.93	0.21	0.65

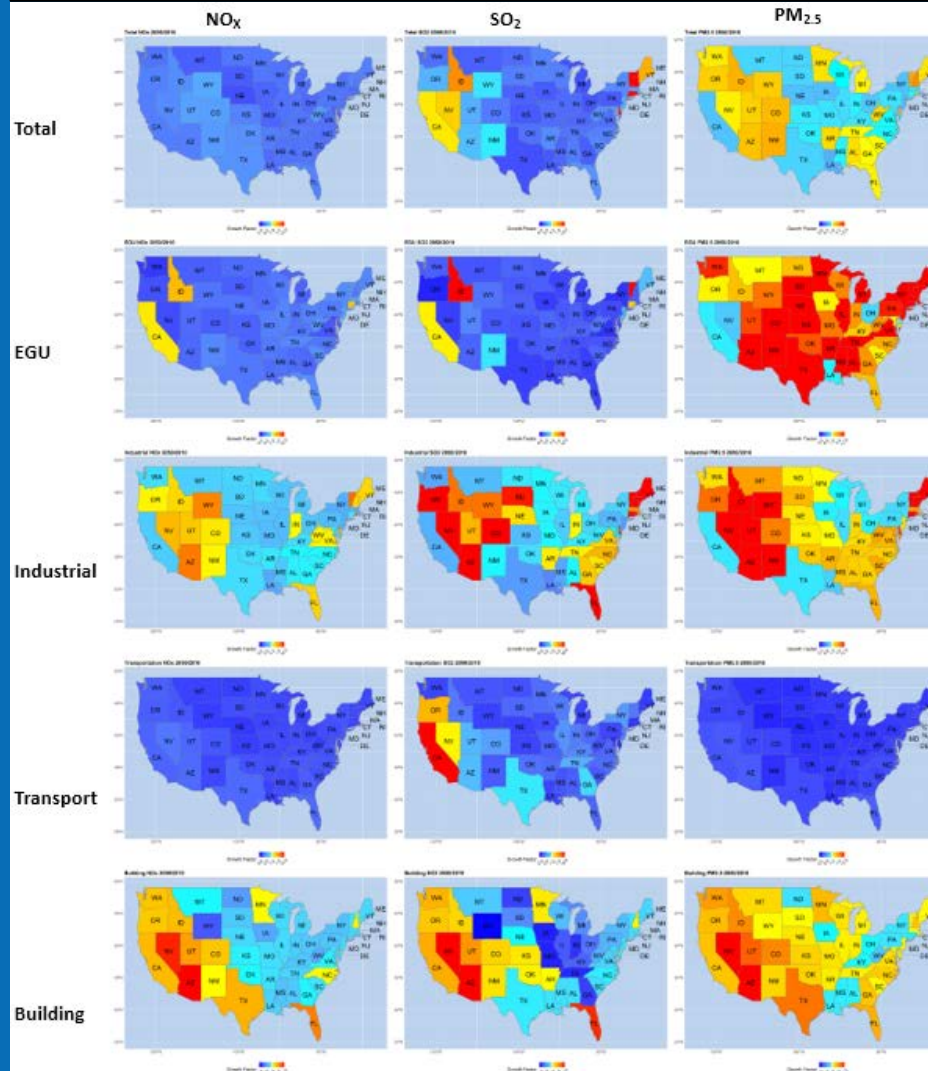
Projecting emissions

State-level 2010 to 2050 growth and control factors

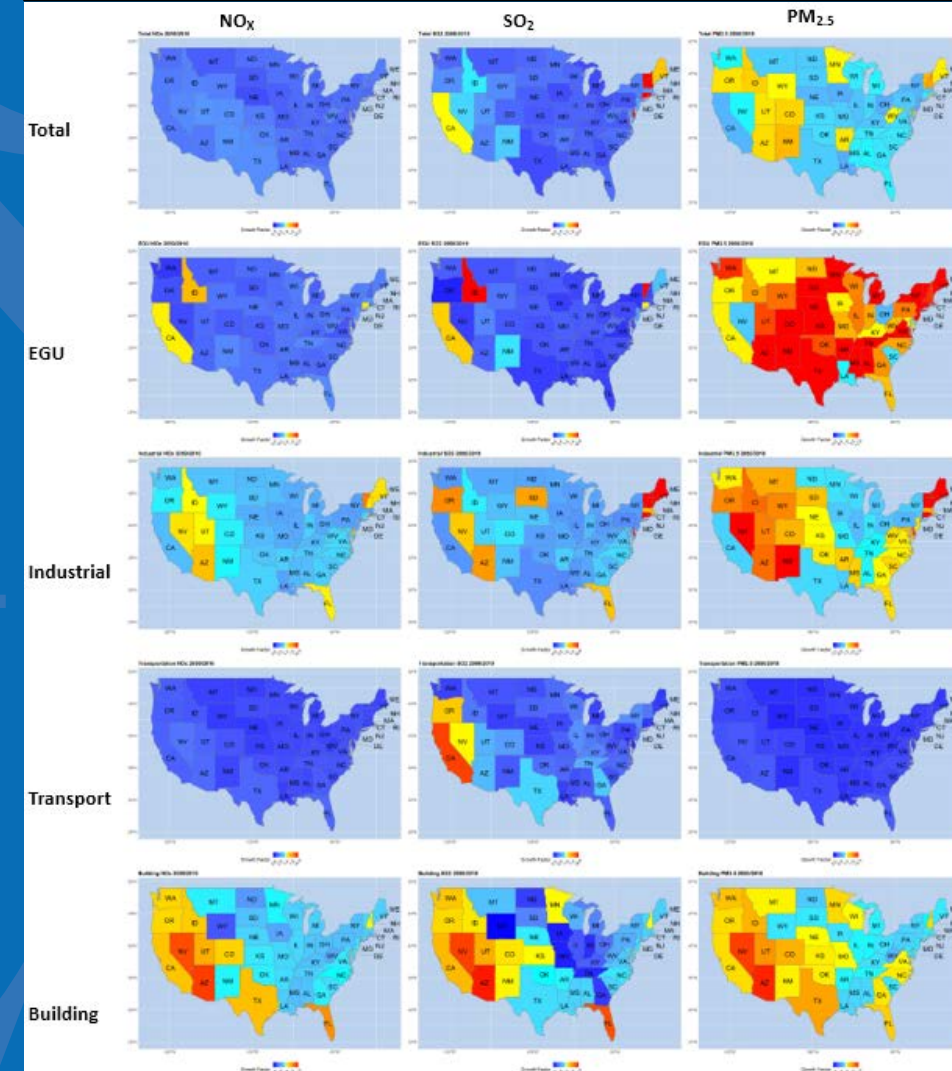
Examining growth and control factors geographically provides some insights into state and regional trends.



Reference case



Alternative scenario



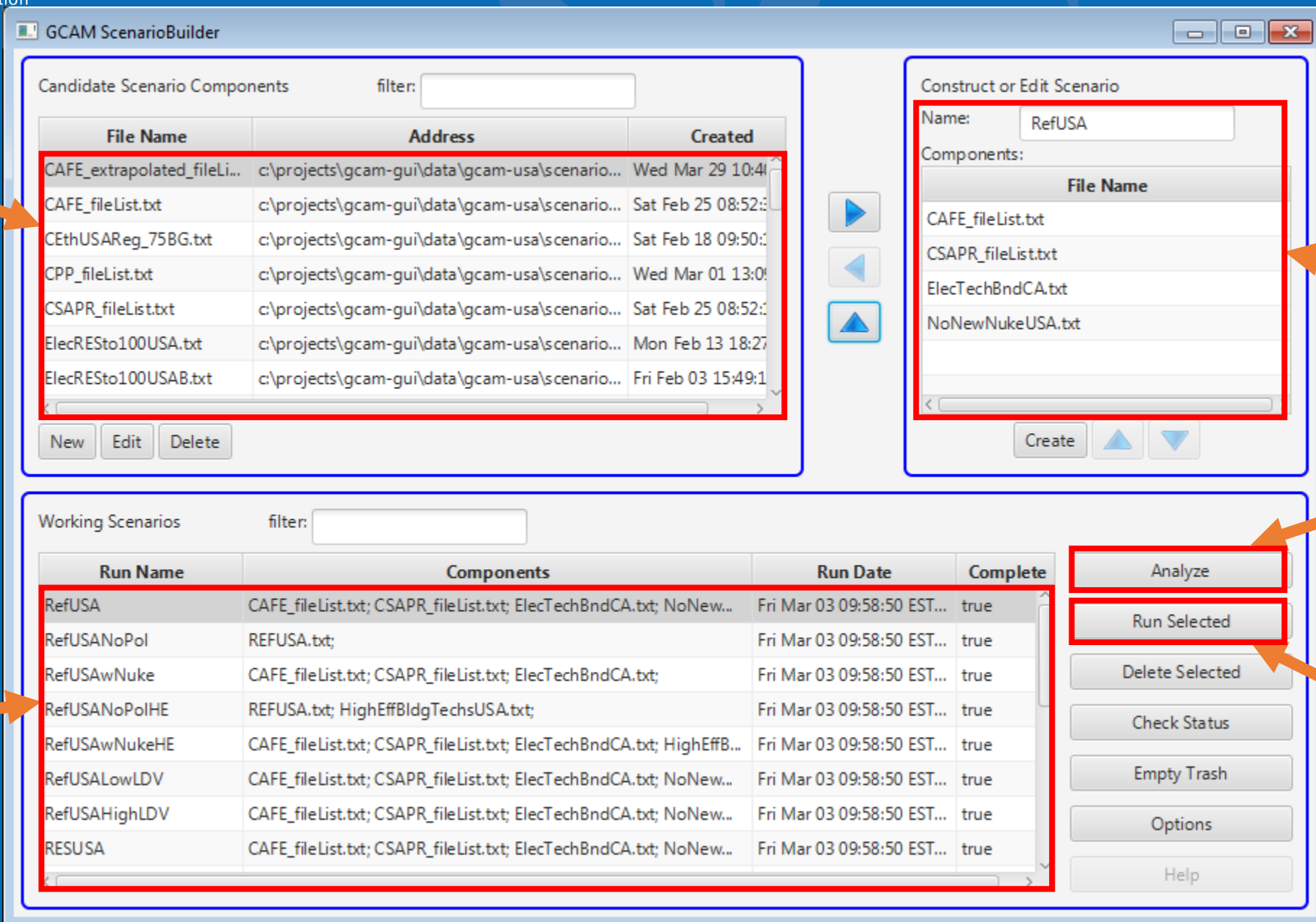
Application: Renewable Electricity Standard (RES)

Hypothetical RES target - percent of electricity generated from new capacity added in that year, applied to each state in the US:

2020	-	30%
2030	-	40%
2040	-	50%
2050	-	60%

GLIMPSE Scenario Builder

Scenario
building
blocks



GCAM ScenarioBuilder

Candidate Scenario Components filter:

File Name	Address	Created
CAFE_extrapolated_fileLi...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed Mar 29 10:41
CAFE_fileList.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Sat Feb 25 08:52:5
CEthUSAReg_75BG.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Sat Feb 18 09:50:5
CPP_fileList.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed Mar 01 13:01
CSAPR_fileList.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Sat Feb 25 08:52:5
ElecRESto100USA.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:27
ElecRESto100USAB.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Feb 03 15:49:1

New Edit Delete

Construct or Edit Scenario

Name: RefUSA

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt

Create

Working Scenarios filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

Creating
a scenario

Analysis of
results

Library of
scenarios

One-click
scenario
execution

GCAM ScenarioBuilder

Candidate Scenario Components filter:

File Name	Address	Created
CAFE_extrapolated_fileLi...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed Mar 29 10:41
CAFE_fileList.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Sat Feb 25 08:52:5
CEthUSAREg_75BG.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Sat Feb 18 09:50:1
CPP_fileList.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed Mar 01 13:08
CSAPR_fileList.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Sat Feb 25 08:52:5
ElecRESto100USA.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:27
ElecRESto100USAB.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Feb 03 15:49:1

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Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt

Create

Existing Scenarios filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

New Scenario Component

Preset

Tech Bound

XML List

Component:

Action: Emission Cap (Mt)

Sector: System Wide

Parameter: NOx

Populate:

Type: Initial w/% Growth

Start Year: 2020

End Year: 2100

Initial Amount:

Growth (%):

Values:

Populate

Delete

Clear

Year	Value
No content in table	

Add

Applied to:

▶

☐ world

Save

Close

New Scenario Component

PresetTech BoundXML List

Component:

Action:

Emission Cap (Mt)

Sector:

Emission Cap (Mt)

Parameter:

Emission Tax (\$/t)

Populate:

Renewable Elec Std (%)

Type:

Cell Ethanol Shock (EJ)

Initial w/% Growth

Start Year:

2020

End Year:

2100

Initial Amount:

Growth (%):

Values:

PopulateDeleteClear

Year	Value
No content in table	

Add

Applied to:

▶

☐ world

SaveClose

New Scenario Component

Preset

Tech Bound

XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial w/% Growth

Start Year: 2020

End Year: 2100

Initial Amount:

Growth (%):

Values:

Populate

Delete

Clear

Year	Value
No content in table	

Add

Applied to:

world

Save

Close

New Scenario Component

Preset

Tech Bound

XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial w/% Growth

Start Year: Initial w/% Growth

End Year: Initial w/Delta

Initial Amount: Initial and Final

Growth: Table w/% Change

Growth: Table w/Delta

Values:

Populate

Delete

Clear

Year	Value
No content in table	

Add

Applied to:

▶

☐ world

Save

Close

New Scenario Component

PresetTech BoundXML List

Component:

Action:Renewable Elec Std (%)

Sector:Electric Sector

Parameter:N/A

Populate:

Type:Initial and Final

Start Year:2020

End Year:2100

Initial Amount:

Final Amount:

Values:PopulateDeleteClear

Year	Value
No content in table	

Add

Applied to:

▶

☐ world

SaveClose

New Scenario Component

Preset

Tech Bound

XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial and Final

Start Year: 2020

End Year: 2050

Initial Amount:

Final Amount:

Values:

Populate

Delete

Clear

Year	Value
No content in table	

Add

Applied to:

▶

☐ world

Save

Close

New Scenario Component

Preset Tech Bound XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial and Final

Start Year: 2020

End Year: 2050

Initial Amount: 30

Final Amount:

Values: Populate Delete Clear


Year	Value
No content in table	

Applied to:

▶ ☐ world

Add

Save Close



New Scenario Component

Preset

Tech Bound

XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial and Final

Start Year: 2020

End Year: 2050

Initial Amount: 30

Final Amount: 60

Values:

Populate

Delete

Clear

	Value
No content in table	

Add

Applied to:

▶

☐ world

Save

Close

New Scenario Component

Preset Tech Bound XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial and Final

Start Year: 2020

End Year: 2050

Initial Amount: 30

Final Amount: 60

Values: Populate Delete Clear

Year	Value
2020	30.00
2025	35.00
2030	40.00
2035	45.00
2040	50.00
2045	55.00
2050	60.00

Applied to: ☐ world

Save Close

New Scenario Component

Preset Tech Bound XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial and Final

Start Year: 2020

End Year: 2050

Initial Amount: 30

Final Amount: 60

Values: Populate Delete Clear

Year	Value
2020	30.00
2025	35.00
2030	40.00
2035	45.00
2040	50.00
2045	55.00
2050	60.00

Applied to:

☐ world

☒ USA

☐ AL

☐ AK

☐ AZ

☐ AR

☐ CA

☐ CO

☐ CT

☐ DE

☐ DC

☐ FL

☐ GA

☐ HI

Save Close

New Scenario Component

Preset Tech Bound XML List

Component:

Action: Renewable Elec Std (%)

Sector: Electric Sector

Parameter: N/A

Populate:

Type: Initial and Final

Start Year: 2020

End Year: 2050

Initial Amount: 30

Final Amount: 60

Values: Populate Delete Clear

Year	Value
2020	30.00
2025	35.00
2030	40.00
2035	45.00
2040	50.00
2045	55.00
2050	60.00

Applied to:

- world
 - ☒ USA
 - ☒ AL
 - ☒ AK
 - ☒ AZ
 - ☒ AR
 - ☒ CA
 - ☒ CO
 - ☒ CT
 - ☒ DE
 - ☒ DC
 - ☒ FL
 - ☒ GA
 - ☒ HI

Save Close

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:01
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60_...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:41

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name
No content in table

Create

▲

▼

Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60_...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name

No content in table

Create

▲

▼

Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60_...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt

Create

Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60_...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Comp

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt
ElecRES_USA_30-60_2020-2050.txt

Create

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Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt
ElecRES_USA_30-60_2020-2050.txt

Create

Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt
ElecRES_USA_30-60_2020-2050.txt

Create

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Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60_...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt
ElecRES_USA_30-60_2020-2050.txt

Create

Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
[Empty Table]		

Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt
ElecRES_USA_30-60_2020-2050.txt

Create

c:\projects\models\gcam\ord-gcam-usa_4p3\main_user_workspace\exe\Objects-Main.exe

Parsing ../input/gcam-data-system/xml/energy-xml/en_supply.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/en_transformation.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/electricity.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/heat.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/hydrogen.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/en_distribution.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/industry.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/industry_incelas_gcam3.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/cement.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/cement_incelas_gcam3.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/en_Fert.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/HDDCDD_constdd_no_GCM.xml scenario component.
Parsing ../input/gcam-data-system/xml/energy-xml/building_det.xml scenario component.

Date	Complete
16:26:06 E...	true
09:58:50 EST...	true
Fri Mar 03 09:58:50 EST...	true
Fri Mar 03 09:58:50 EST...	true
Fri Mar 03 09:58:50 EST...	true
Fri Mar 03 09:58:50 EST...	true
Fri Mar 03 09:58:50 EST...	true
Fri Mar 03 09:58:50 EST...	true

Analyze
Run Selected
Delete Selected
Check Status
Empty Trash
Options
Help

RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

GCAM ScenarioBuilder

Candidate Scenario Components

filter:

File Name	Address	Created
SysTaxCO2Reg2.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Mon Feb 13 18:28:02
SysTaxCO2Reg_NE20...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Wed May 10 14:51:0
TechBnd_CA_HFCV.txt	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:33:13
TechBnd_CA_LDVCon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 11:28:22
TechBnd_CA_LDVEon...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Tue Mar 28 10:31:41
TechBnd_USA_LDVEo...	c:\projects\gcam-gui\data\gcam-usa\scenario...	Fri Apr 28 08:04:38 E
ElecRES_USA_30-60_...	C:\Projects\GCAM-GUI\data\GCAM-USA\Scen...	Wed May 17 08:21:4

New

Edit

Delete

Construct or Edit Scenario

Name:

Components:

File Name
CAFE_fileList.txt
CSAPR_fileList.txt
ElecTechBndCA.txt
NoNewNukeUSA.txt
ElecRES_USA_30-60_2020-2050.txt

Create

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Working Scenarios

filter:

Run Name	Components	Run Date	Complete
RefUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Mon May 01 16:26:06 E...	true
RefUSANoPol	REFUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNuke	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSANoPolHE	REFUSA.txt; HighEffBldgTechsUSA.txt;	Fri Mar 03 09:58:50 EST...	true
RefUSAwNukeHE	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; HighEffB...	Fri Mar 03 09:58:50 EST...	true
RefUSALowLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RefUSAHighLDV	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true
RESUSA	CAFE_fileList.txt; CSAPR_fileList.txt; ElecTechBndCA.txt; NoNew...	Fri Mar 03 09:58:50 EST...	true

Analyze

Run Selected

Delete Selected

Check Status

Empty Trash

Options

Help

GLIMPSE Enhanced ModelInterface

[c:\projects\models\gcam\ord-gcam-usa_4p3\main_user_workspace\output\database_basexdb] - ModelInterface

File Edit Table Help

Scenario

- RefUSA 2017-3-3T09:58:51-05:00
- RefUSANoPol 2017-3-3T12:25:31-05:00
- RefUSANuke 2017-3-3T12:55:51-05:00
- RefUSANoPolHE 2017-3-3T14:13:16-05:00
- RefUSANukeHE 2017-3-3T14:41:11-05:00
- RefUSALowLDV 2017-3-3T16:07:47-05:00
- RefUSAHighLDV 2017-3-3T17:24:10-05:00
- RESUSA 2017-3-3T19:03:56+19:00
- RefUSAIPM 2017-3-3T20:43:57+19:00
- RefUSAIPMNuke 2017-6-3T18:43:04-05:00
- CAonlyLDVE 2017-28-3T11:25:23-04:00
- CAonlyHFCV 2017-28-3T13:57:17-04:00
- CAonlyRES 2017-28-3T16:32:42-04:00
- CAonlyDVC 2017-28-3T20:37:51+20:00

Regions

- USA
- Africa_Eastern
- Africa_Northern
- Africa_Southern
- Africa_Western
- Australia_NZ
- Brazil
- Canada
- Central America an
- Central Asia
- China
- EU-12
- EU-15

Queries

- Primary Energy
 - Primary Energy Consumption (Average Fossil Efficiency Conversion)
 - Primary Energy Consumption (Direct Equivalent)
 - Primary energy with CCS (Direct Equivalent)
 - Resource production
 - Regional primary energy costs
- Electricity
 - Electricity generation by region (ind rooftop PV and CHP)
 - Electricity generation by region (central only)
 - Electricity generation by aggregate technology

Run Query Update Single Queries Create Remove Edit

Electricity generation by aggregate technology

scen...	region	techn...	1990	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2065	2080	2095	Units
RefUS...	CA	Coal-G...	0	0	0.007	0.006	0.006	0.005	0.005	0.004	0.003	0.003	0.002	0	0	0	EJ
RefUS...	CA	a Coal	0.007	0.008	0.001	0.006	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0	0	0	EJ
RefUS...	CA	c Gas	0.2	0.302	0.339	0.482	0.55	0.668	0.744	0.812	0.947	1.041	1.123	0	0	0	EJ
RefUS...	CA	e Oil	0.017	0.009	0.004	0.004	0.004	0.006	0.005	0.005	0.008	0.008	0.009	0	0	0	EJ
RefUS...	CA	g Biomass	0.018	0.02	0.02	0.016	0.017	0.022	0.026	0.031	0.04	0.045	0.051	0	0	0	EJ
RefUS...	CA	i Nuclear	0.125	0.135	0.121	0.142	0.15	0.142	0.132	0.119	0.104	0.089	0.076	0	0	0	EJ
RefUS...	CA	j Geoth...	0.054	0.054	0.052	0.077	0.088	0.106	0.12	0.133	0.109	0.109	0.12	0	0	0	EJ
RefUS...	CA	k Hydro	0.081	0.146	0.122	0.122	0.122	0.122	0.122	0.122	0.122	0.122	0.122	0	0	0	EJ
RefUS...	CA	l Wind	0.011	0.015	0.022	0.034	0.04	0.053	0.064	0.076	0.078	0.089	0.104	0	0	0	EJ
RefUS...	CA	m Solar	0	0.002	0.007	0.012	0.015	0.021	0.026	0.032	0.037	0.044	0.053	0	0	0	EJ
RefUS...	CA	n CHP	0.035	0.036	0.036	0.027	0.028	0.025	0.026	0.027	0.028	0.029	0.03	0	0	0	EJ

Refresh Display 1 StackedB...

Electricity generation by aggregate technology

output (EJ)

Year

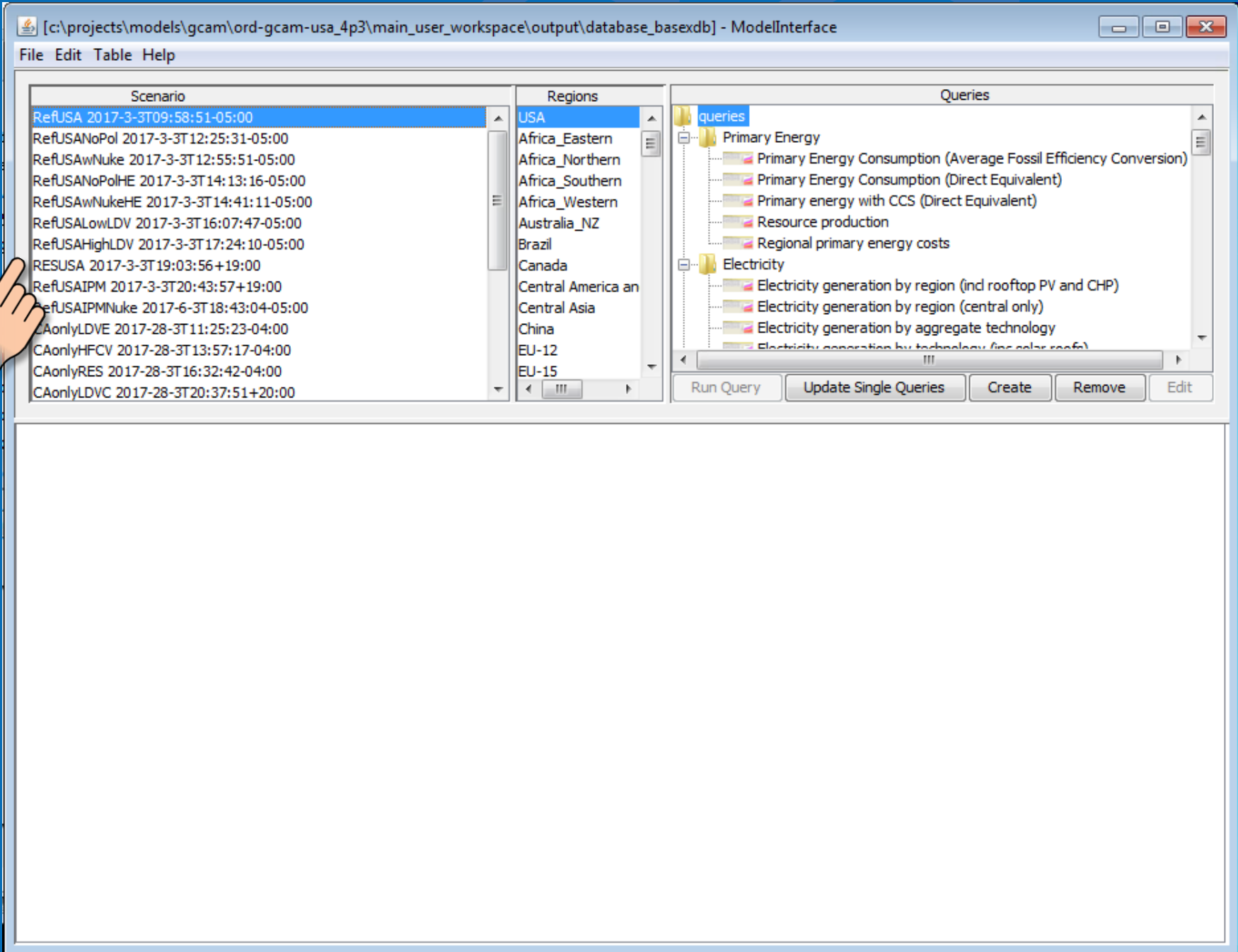
Scenarios
in results
database

List of scenario
outputs that can
be queried

Modeled
regions

Query results

Query
visualization



[c:\projects\models\gcam\ord-gcam-usa_4p3\main_user_workspace\output\database_basexdb] - ModelInterface

File Edit Table Help

Scenario	Regions	Queries
RefUSA 2017-3-3T09:58:51-05:00	USA	queries
RefUSANoPol 2017-3-3T12:25:31-05:00	Africa_Eastern	Primary Energy
RefUSAwNuke 2017-3-3T12:55:51-05:00	Africa_Northern	Primary Energy Consumption (Average Fossil Efficiency Conversion)
RefUSANoPolHE 2017-3-3T14:13:16-05:00	Africa_South	Primary Energy Consumption (Direct Equivalent)
RefUSAwNukeHE 2017-3-3T14:41:11-05:00	Africa_Western	Primary energy with CCS (Direct Equivalent)
RefUSALowLDV 2017-3-3T16:07:47-05:00	Australia	Resource production
RefUSAHighLDV 2017-3-3T17:24:10-05:00	Brazil	Regional primary energy costs
RESUSA 2017-3-3T19:03:56+19:00	Canada	Electricity
RefUSAIPM 2017-3-3T20:43:57+19:00	Central America and the Caribbean	Electricity generation by region (incl rooftop PV and CHP)
RefUSAIPMNuke 2017-6-3T18:43:04-05:00	Central Asia	Electricity generation by region (central only)
CAonlyLDVE 2017-28-3T11:25:23-04:00	China	Electricity generation by aggregate technology
CAonlyHFCV 2017-28-3T13:57:17-04:00	EU-12	Electricity generation by technology (incl solar roofs)
CAonlyRES 2017-28-3T16:32:42-04:00	EU-15	
CAonlyLDVC 2017-28-3T20:37:51+20:00		


Run Query Update Single Queries Create Remove Edit

[c:\projects\models\gcam\ord-gcam-usa_4p3\main_user_workspace\output\database_basexdb] - ModelInterface

File Edit Table Help

Scenario	Regions	Queries
RefUSA 2017-3-3T09:58:51-05:00	Argentina	queries
RefUSANoPol 2017-3-3T12:25:31-05:00	Colombia	Primary Energy
RefUSAwNuke 2017-3-3T12:55:51-05:00	AL	Primary Energy Consumption (Average Fossil Efficiency Conversion)
RefUSANoPolHE 2017-3-3T14:13:16-05:00	AK	Primary Energy Consumption (Direct Equivalent)
RefUSAwNukeHE 2017-3-3T14:41:11-05:00	AZ	Primary energy with CCS (Direct Equivalent)
RefUSALowLDV 2017-3-3T16:07:47-05:00	AR	Resource production
RefUSAHighLDV 2017-3-3T17:24:10-05:00	CA	Regional primary energy costs
RESUSA 2017-3-3T19:03:56+19:00	CO	Electricity
RefUSAIPM 2017-3-3T20:43:57+19:00	CT	Electricity generation by region (incl rooftop PV and CHP)
RefUSAIPMNuke 2017-6-3T18:43:04-05:00	DE	Electricity generation by region (central only)
CAonlyLDVE 2017-28-3T11:25:23-04:00	DC	Electricity generation by aggregate technology
CAonlyHFCV 2017-28-3T13:57:17-04:00	FL	Electricity generation by technology (incl solar roofs)
CAonlyRES 2017-28-3T16:32:42-04:00	GA	
CAonlyLDVC 2017-28-3T20:37:51+20:00		

Run Query U Queries Create Remove Edit




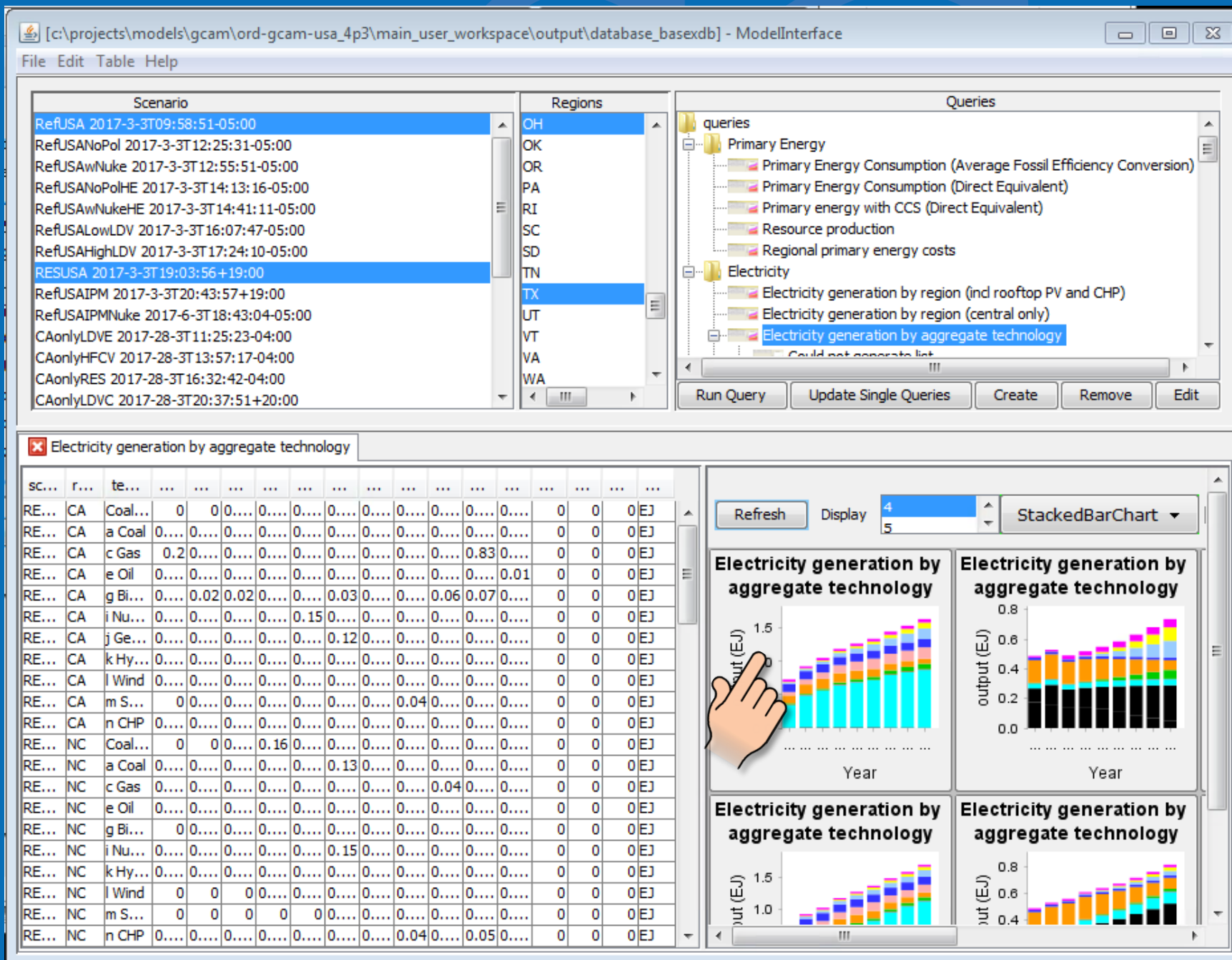
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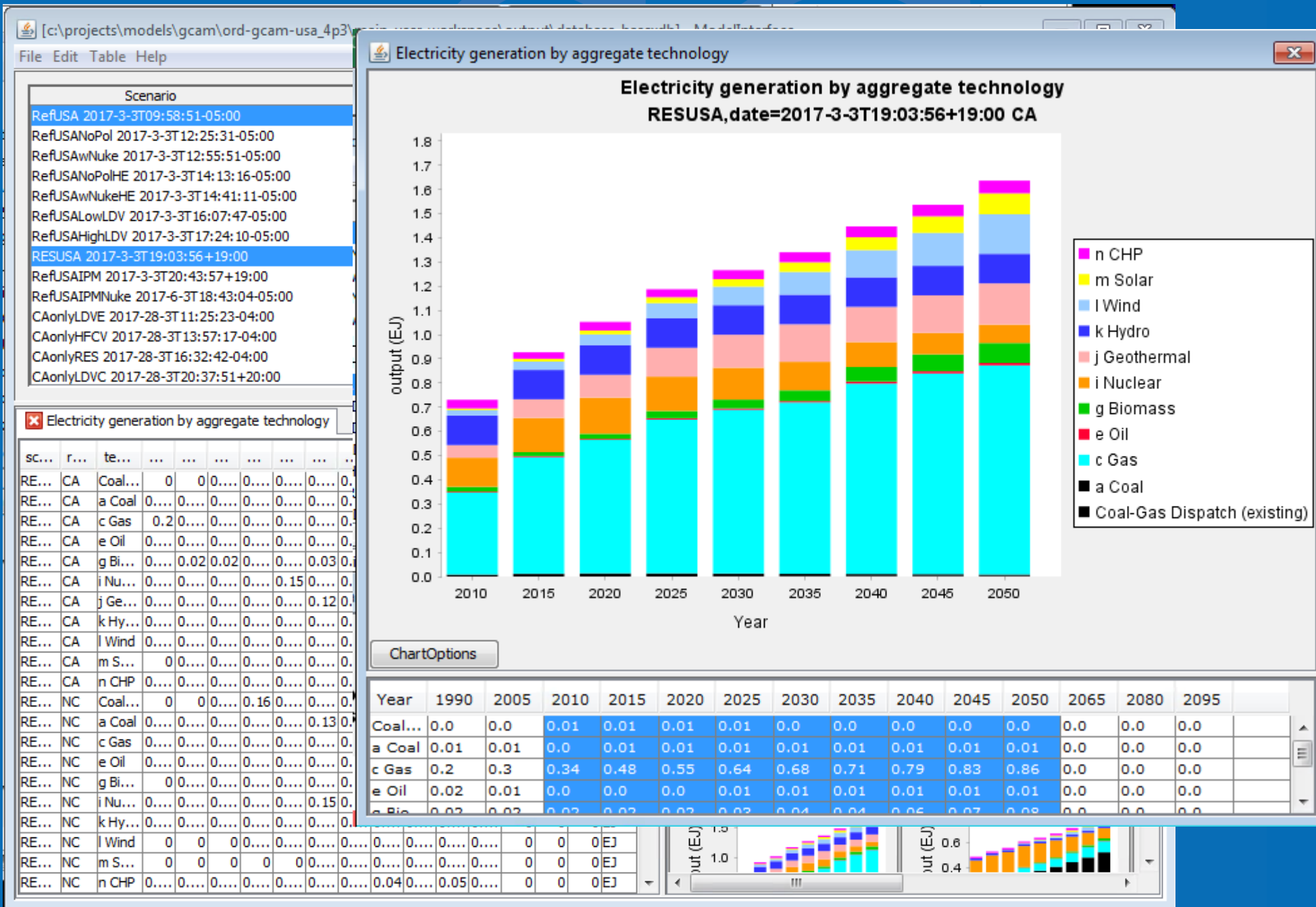
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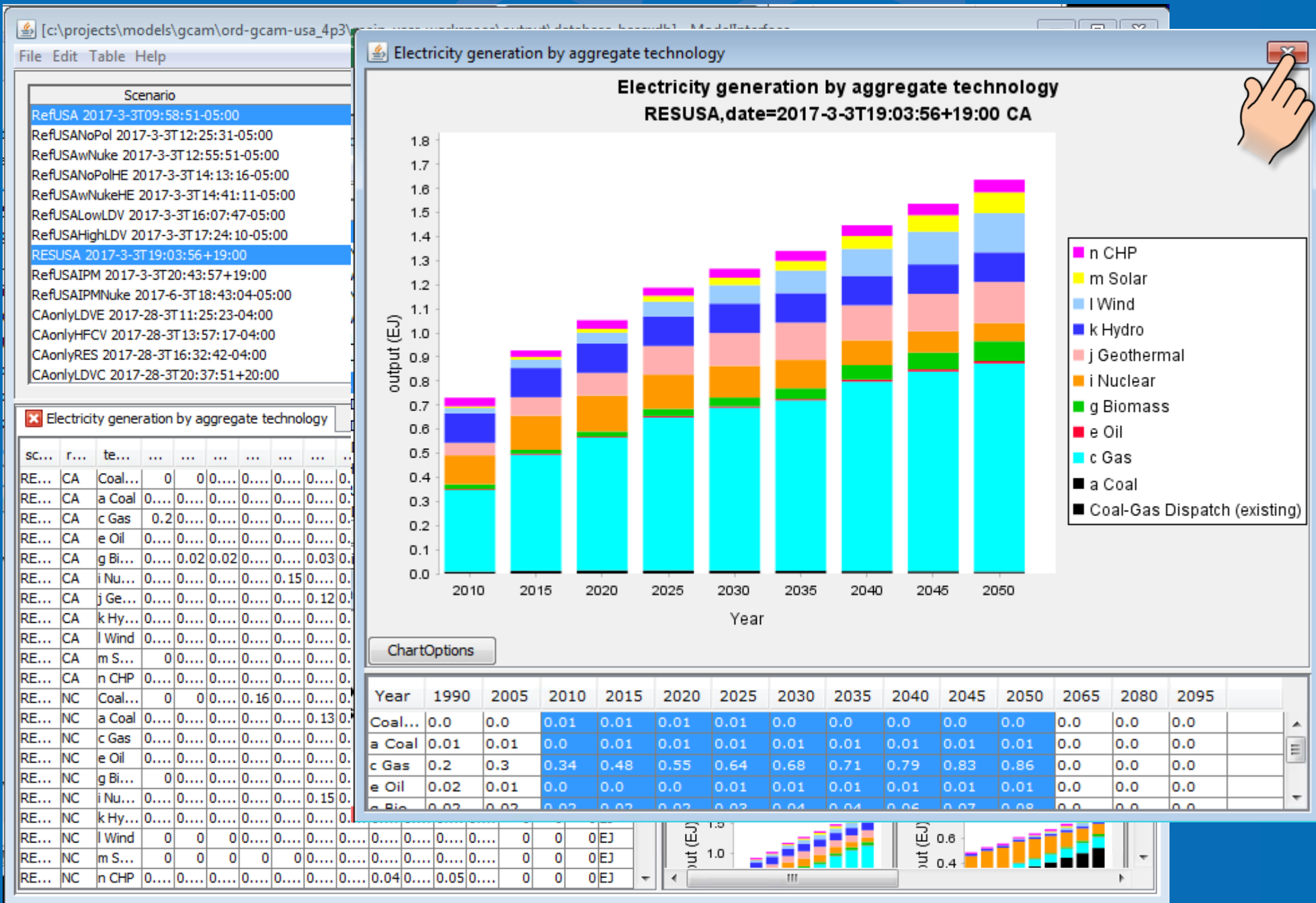
Scenario	Regions	Queries
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RefUSAwNuke 2017-3-3T12:55:51-05:00	AL	Primary Energy Consumption (Average Fossil Efficiency Conversion)
RefUSANoPolHE 2017-3-3T14:13:16-05:00	AK	Primary Energy Consumption (Direct Equivalent)
RefUSAwNukeHE 2017-3-3T14:41:11-05:00	AZ	Primary energy with CCS (Direct Equivalent)
RefUSALowLDV 2017-3-3T16:07:47-05:00	AR	Resource production
RefUSAHighLDV 2017-3-3T17:24:10-05:00	CA	Regional primary energy costs
RESUSA 2017-3-3T19:03:56+19:00	CO	Electricity
RefUSAIPM 2017-3-3T20:43:57+19:00	CT	Electricity generation by region (ind rooftop PV and CHP)
RefUSAIPMNuke 2017-6-3T18:43:04-05:00	DE	Electricity generation by region (central only)
CAonlyLDVE 2017-28-3T11:25:23-04:00	DC	Electricity generation by aggregate technology
CAonlyHFCV 2017-28-3T13:57:17-04:00	FL	Could not generate list
CAonlyRES 2017-28-3T16:32:42-04:00	GA	
CAonlyLDVC 2017-28-3T20:37:51+20:00		

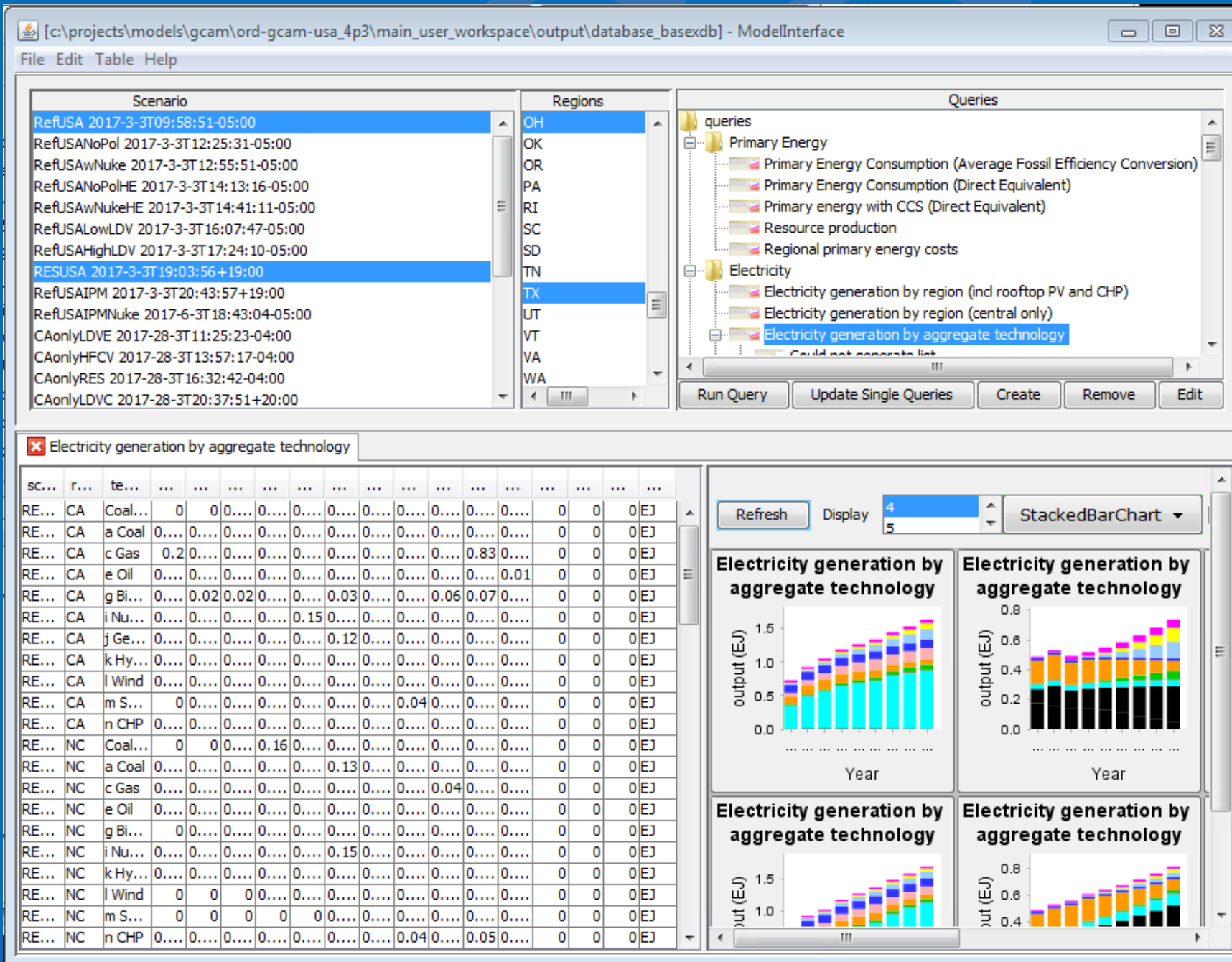
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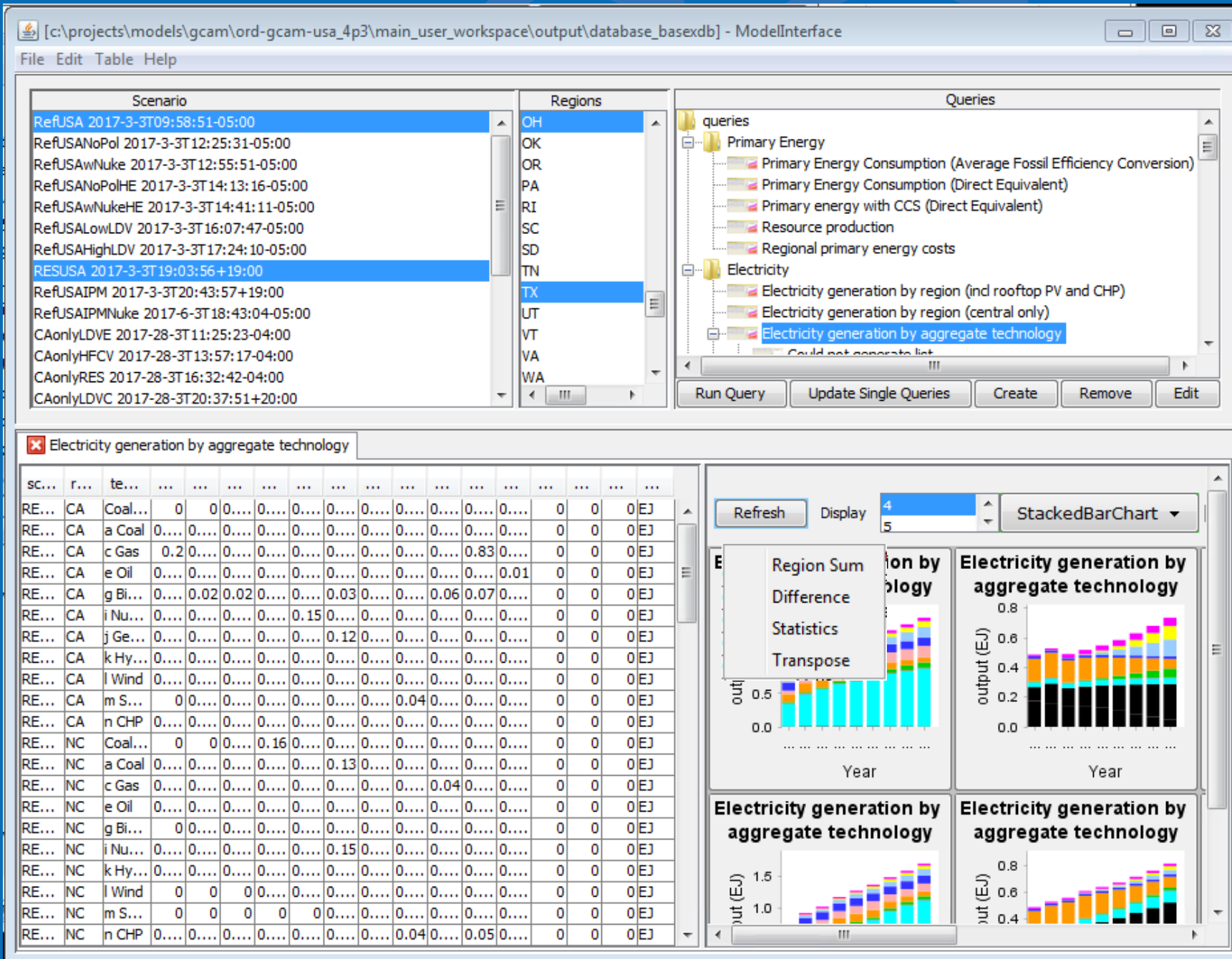


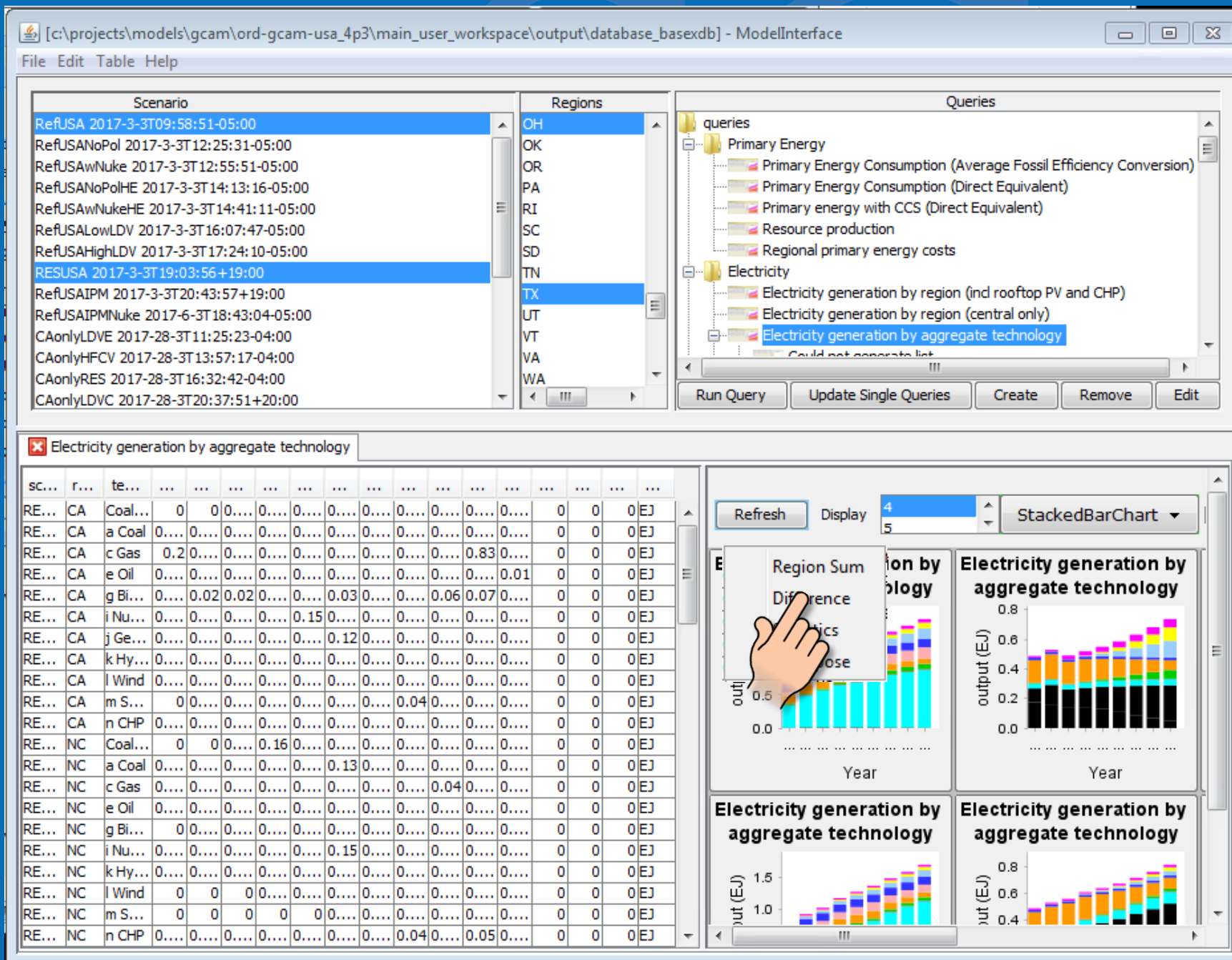


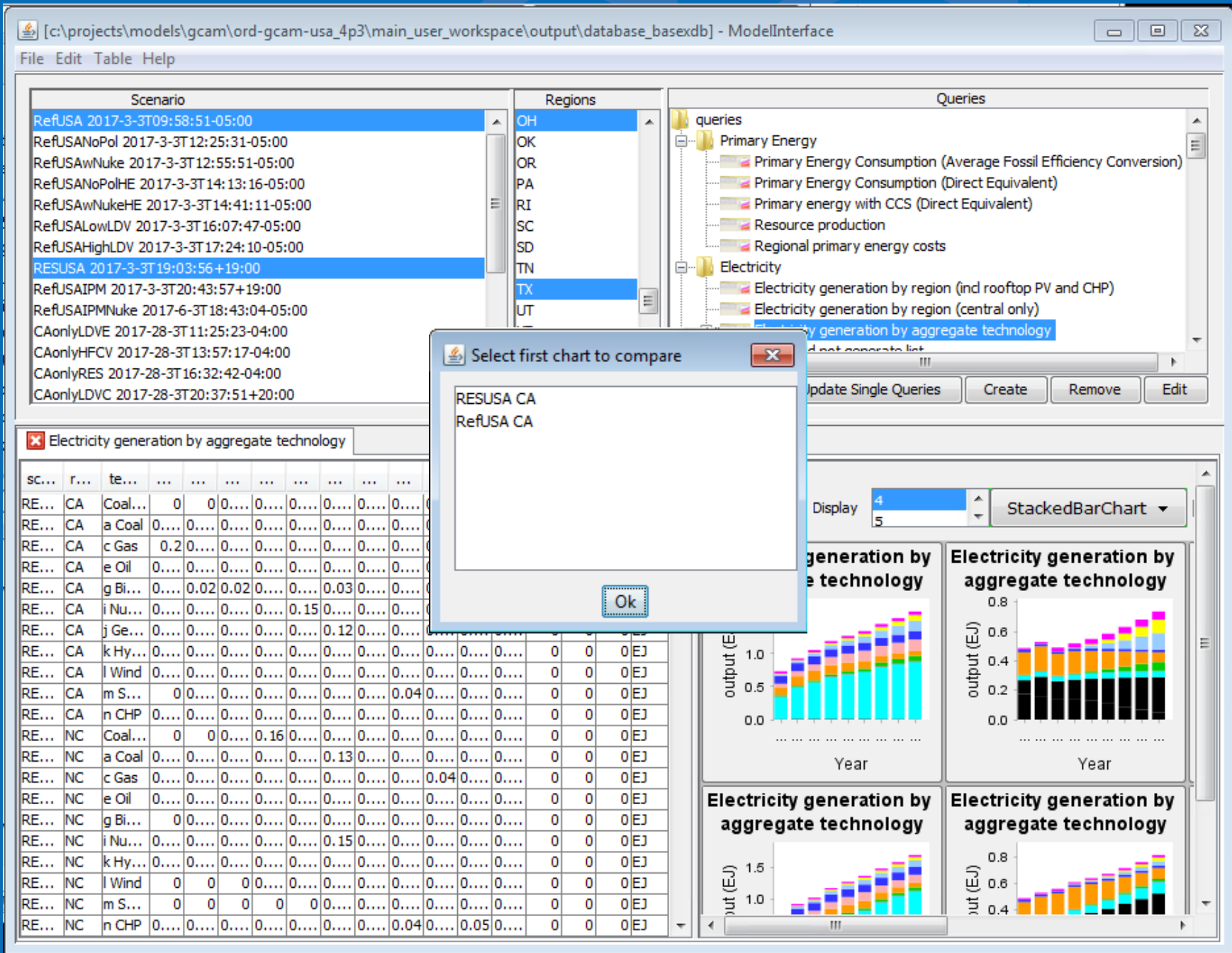


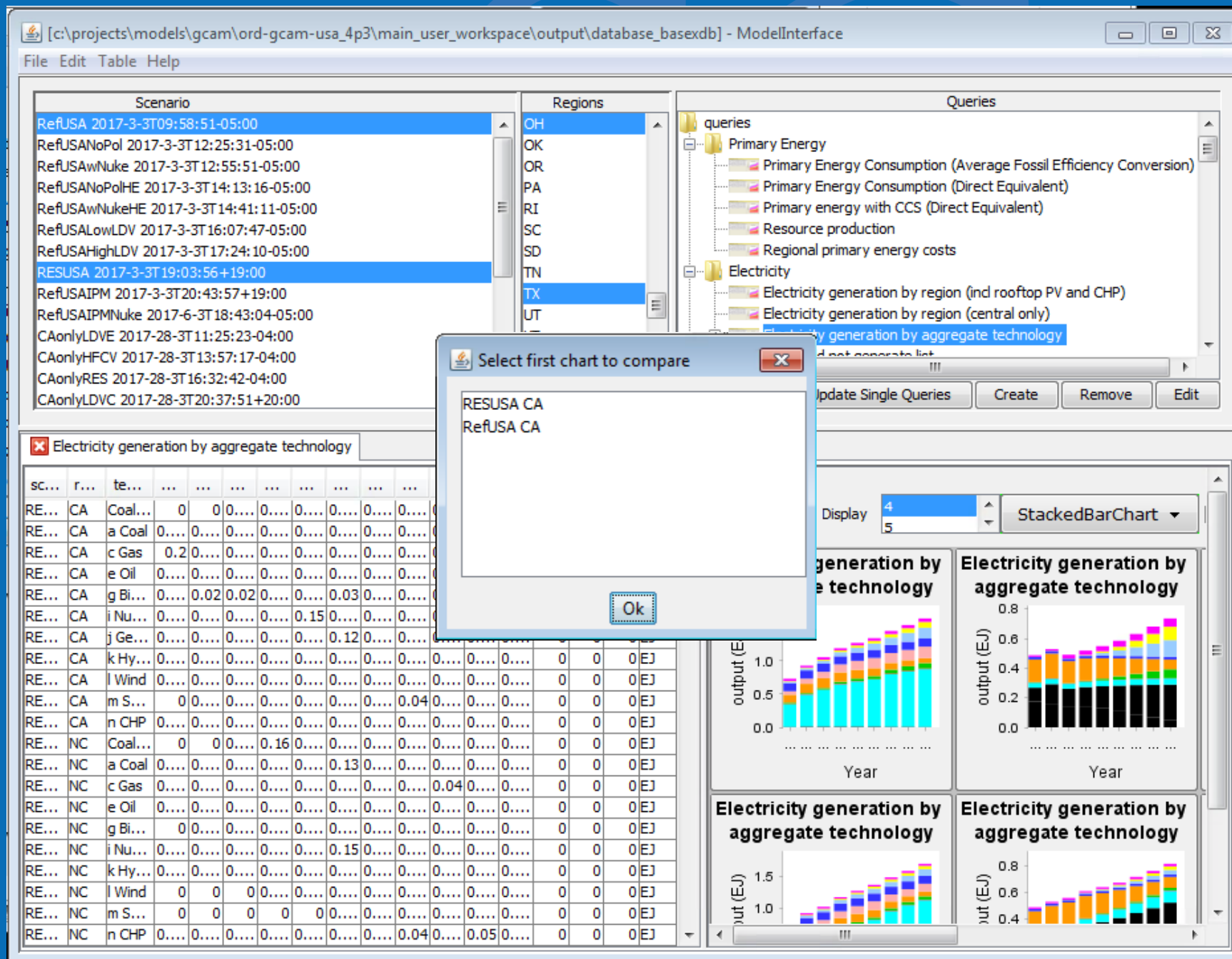


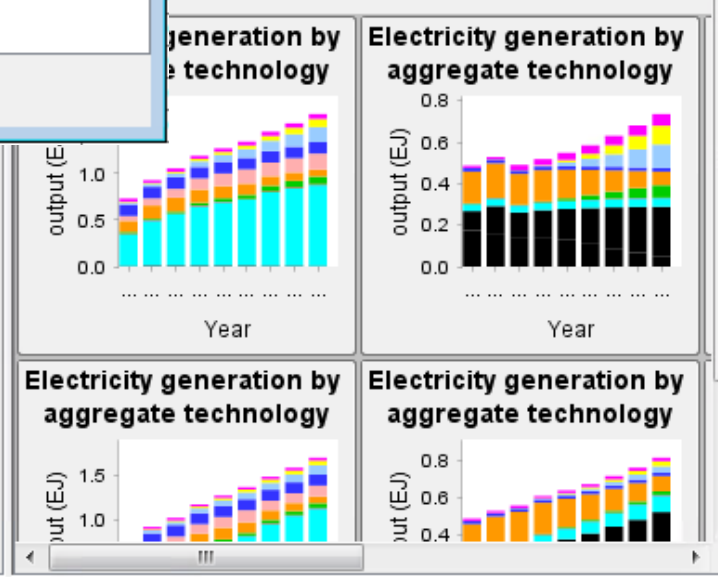


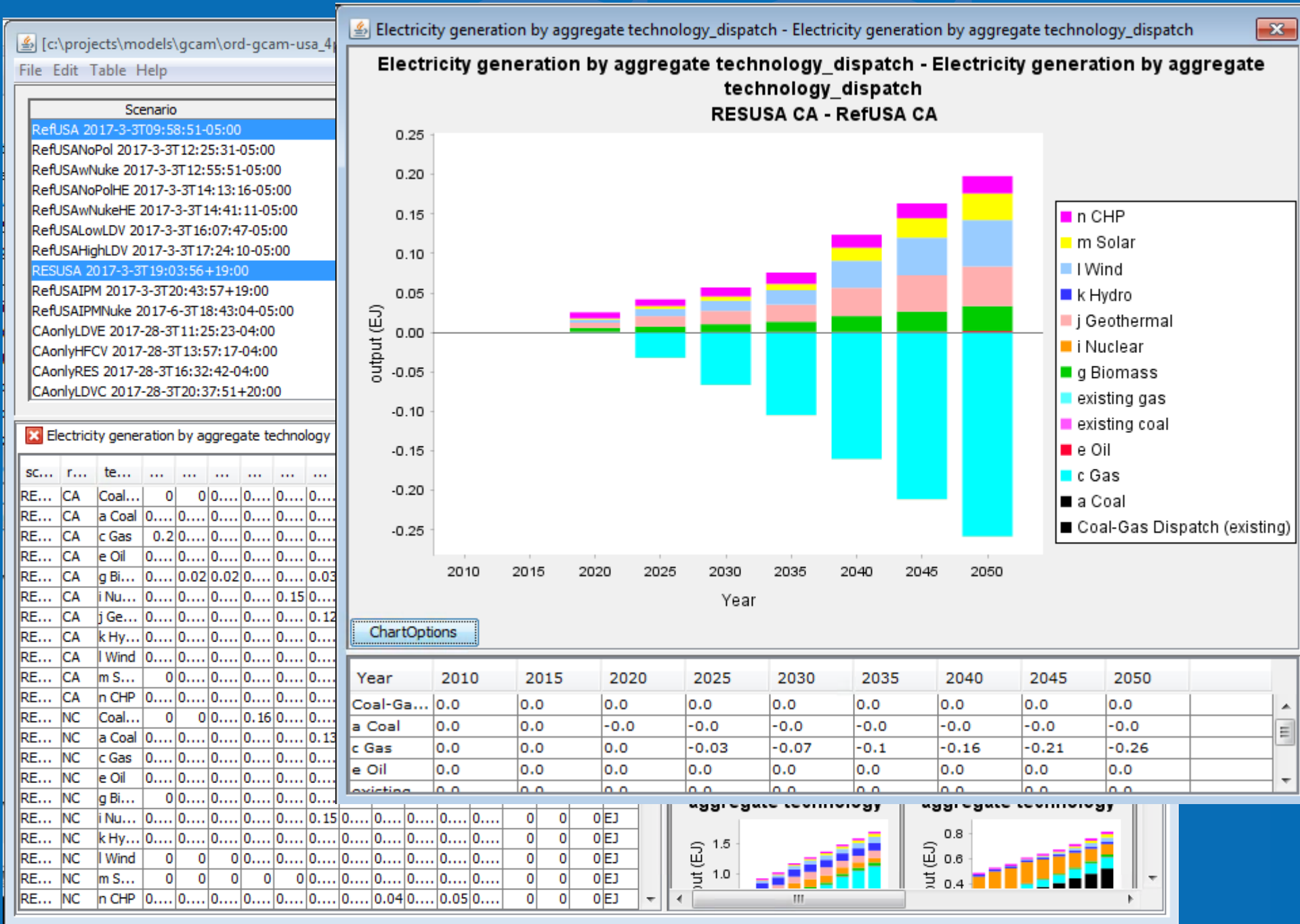








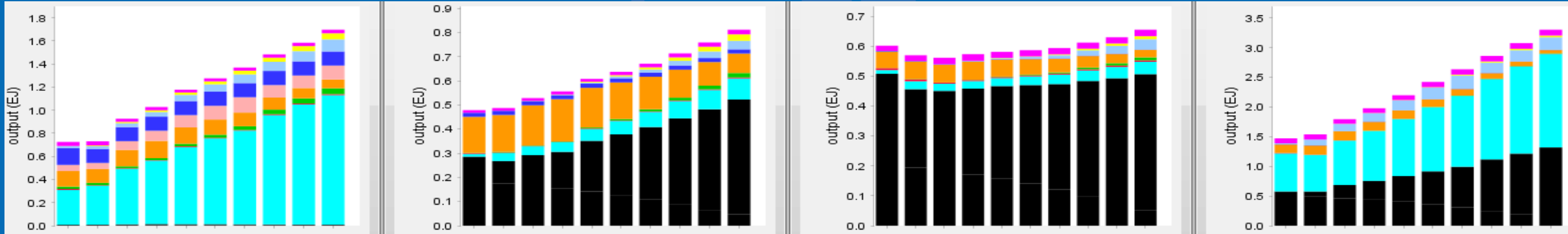




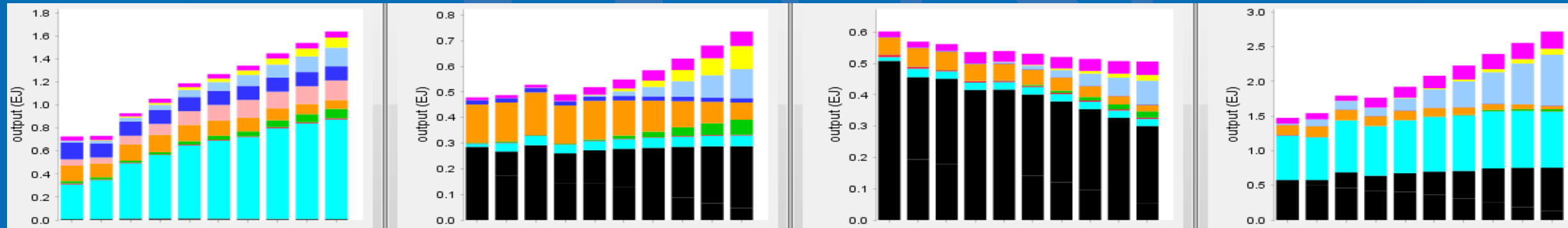
Application: Renewable Electricity Standard

State-level electricity production (2005-2050) by aggregated technology

Reference



RES Constraint



California

North Carolina

Ohio

Texas



Application: Renewable Electricity Standard

Relative to reference case value in that year

Change in
CO₂

Change in
elect

Change in
PM mortality
costs

Increased PM mortality relative to reference largely from:

- Increased biomass for electricity

Other factors:

- Industrial fuel switching in response to electricity and natural gas prices changes
- Minor increase in utilization of refined petroleum products for electricity production

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	
California	0%	0%	0%	1%	1%	0%	0%	0%	-1%	-1%	
Mortality relative to largely from: biomass for electricity			0%	-3%	-6%	-6%	-7%	-7%	-7%	-8%	
			0%	-3%	-3%	-5%	-7%	-9%	-12%	-15%	
			0%	-3%	-5%	-6%	-8%	-10%	-12%	-13%	
S: fuel switching in response to and natural gas prices changes ease in utilization of refined products for electricity			2015	2020	2025	2030	2035	2040	2045	2050	
			0%	6%	7%	7%	8%	8%	7%	7%	
			0%	10%	15%	15%	15%	14%	14%	14%	
			0%	9%	8%	7%	6%	5%	5%	4%	
			0%	12%	15%	16%	17%	17%	18%	18%	
			2015	2020	2025	2030	2035	2040	2045	2050	
	California	0%	0%	0%	2%	3%	5%	6%	7%	8%	9%
	North Carolina	0%	0%	0%	1%	1%	3%	4%	6%	7%	6%
	Ohio	0%	0%	0%	3%	4%	3%	2%	0%	-3%	-6%
Texas	0%	0%	0%	-4%	-5%	-7%	-9%	-11%	-13%	-15%	

Application: Renewable Electricity Standard

Relative to

Change in
CO₂

Change in
elect

Change in
PM mortality
costs

Increased PM mortality relative to reference largely from:

- Increased biomass for electricity

Other factors:

- Industrial fuel switching in response to electricity and natural gas prices changes
- Minor increase in utilization of refined petroleum products for electricity production

Supporting state-level decision making:

Results like these help inform the process and point to important questions to ask:

- Is the amount of biomass increase indicated practical?
- Are there measures in place or that could be taken to avoid this PM health disbenefit?
- Could disbenefits be avoided if the RES were structured differently?

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
California	0%	0%	0%	2%	3%	5%	6%	7%	8%	9%
North Carolina	0%	0%	0%	1%	1%	3%	4%	6%	7%	6%
Ohio	0%	0%	0%	3%	4%	3%	2%	0%	-3%	-6%
Texas	0%	0%	0%	-4%	-5%	-7%	-9%	-11%	-13%	-15%

Next steps

- Continue to foster existing partner relationships
 - EPA Program Offices and Region 1
- Seek out additional partners
 - beta testers for the model and GUI?
 - analyses with EPA regions and states?
- Explore other uses
 - classroom setting, university research projects?
- Applications
 - emission projections, technology assessment, population growth and migration patterns...?
- New GCAM-USA features
 - PNNL: industrial sector improvements, time slices (seasonal day and night)
 - ORD: air pollutant controls from CoST?

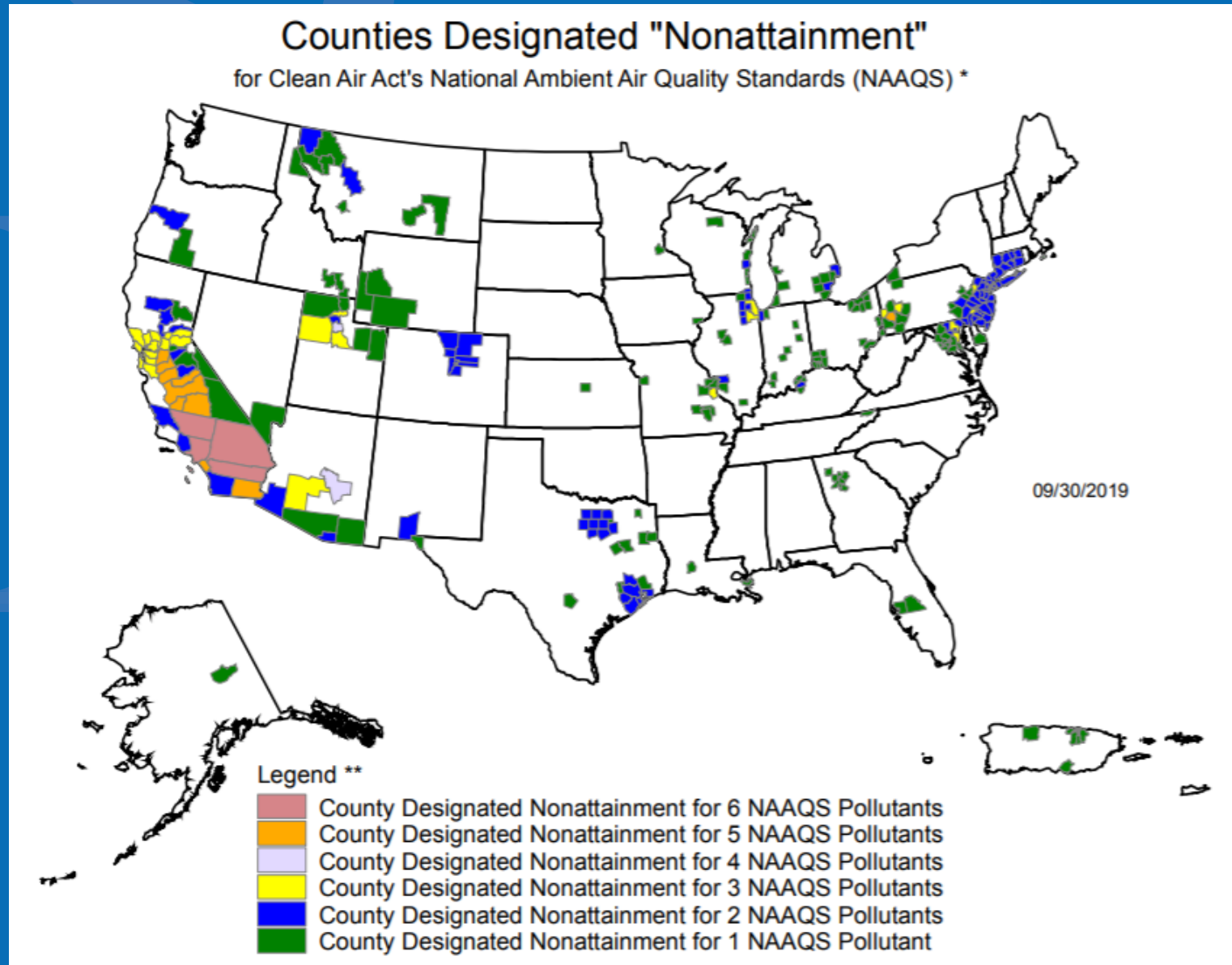
Questions?

Loughlin.Dan@EPA.gov

(919) 541-3928

Background: Air quality today

The Clean Air Act lays out procedures for setting and updating air quality standards. Currently, approximately 140 million Americans live in counties that violate one or more of these standards.



Background: Air quality management

- Long-term planning benefits from consideration of:
 - Population growth and migration
 - Economic growth and transformation
 - Climate change impacts
 - e.g., on water resources and space heating and cooling demands
 - Technology stock and turnover
 - Emerging technologies and fuels
 - Changes in land use, urbanization, and mobility patterns
 - Synergies and tradeoffs with energy and climate goals

Background: Long-term air quality planning

Questions:

- What are the major challenges for air quality management into the future?
- How do existing regulations protect against these challenges?
- How do air quality management strategies affect GHG mitigation goals?
- How do GHG mitigation strategies affect air quality goals?
- What are cost-effective strategies for achieving air quality and GHG mitigation goals simultaneously?

Problem: Climate change, cont'd

States that have GHG emission reduction targets

As of summer, 2019, 23 states and the District of Columbia have set greenhouse gas emission reduction goals.

Examples:

- CA: 80% below 1990 by 2050
- WA: 50% below 1990 by 2050
- NY: 100% below 1990 by 2050
- PA: 80% below 2005 by 2050

Source: <https://www.c2es.org/>

Background: Air quality management

SECTION

Air quality management

- States are responsible for developing plans (SIPs) to bring nonattainment areas into attainment
 - Application of controls on new and existing sources in nonattainment areas
 - Credit may be available for energy efficiency (EE), renewable energy (RE), and other non-traditional measures
- Federal requirements are also in place
 - New Source Review (NSR)
 - Requires controls on new or modified sources
 - New Source Performance Standards (NSPS)
 - Applicable to technologies such as engines, boilers, woodstoves, etc.
 - Cross-State Air Pollution Rule (CSAPR)
 - Addresses pollution from upwind states
 - Maximum Achievable Control Technology (MACT) requirement
 - Reduces toxic emissions