

Crude Oil and Transportation Fuel Price Cases for the 2013 IEPR

Inputs and Methods for the
Transportation Energy Demand Forecast
Hearing Room A

June 26, 2013

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California Energy Commission

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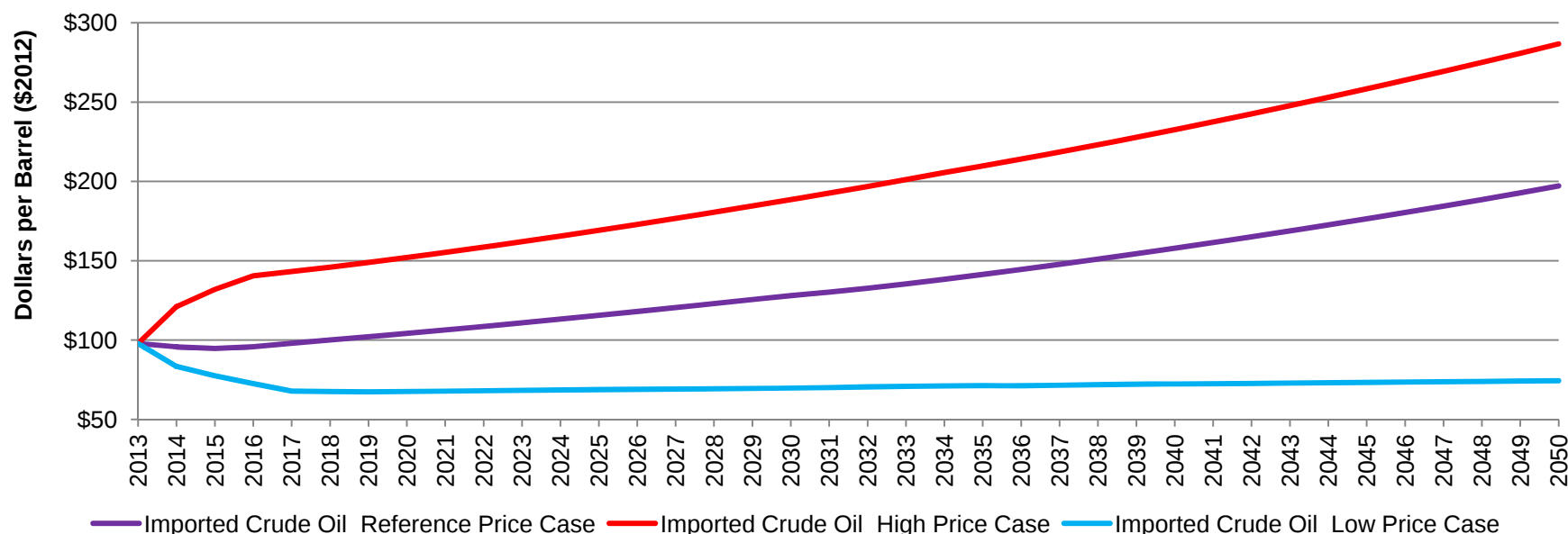


Process and Methods

- Assess other crude oil price forecasts from EIA, IEA, and other organizations
- Staff proposes to use EIA AEO 2013 projections
- Used historical data on U.S. Imported Refiner Acquisition Cost (RAC) of crude oil and state petroleum retail fuel price relationships
- Consult with other offices on prices for natural gas and hydrogen, as well as electricity rates for EVs and plug-in-hybrids
- Solicit expert advice from workshop participants

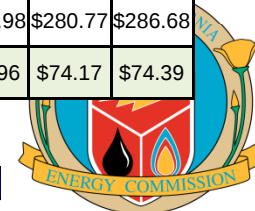


Staff Proposed Refiner Acquisition Cost Cases

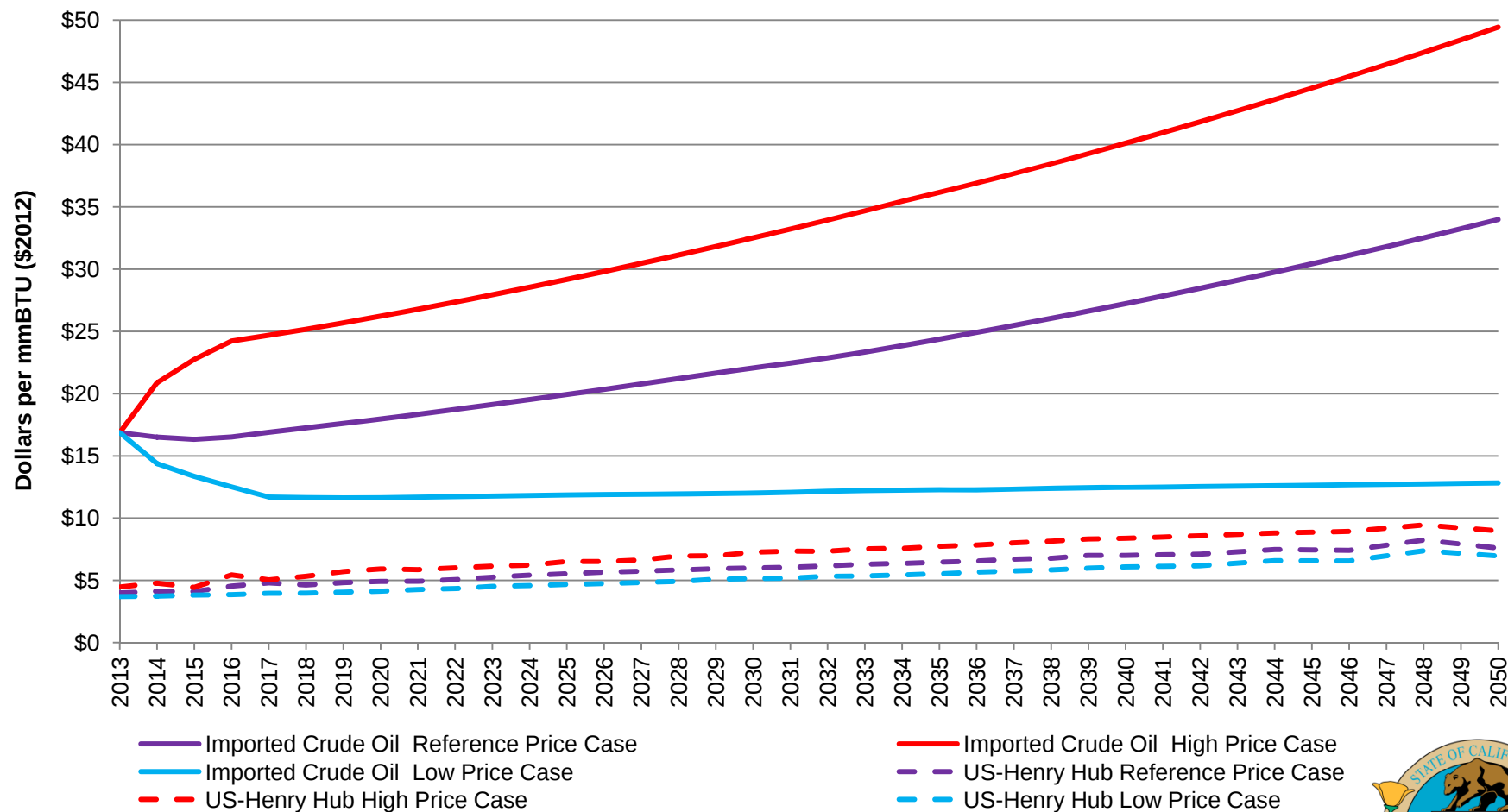


\$2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Imported Crude Oil Reference Price Case	\$97.86	\$95.75	\$94.70	\$95.84	\$97.99	\$100.04	\$102.13	\$104.15	\$106.36	\$108.61	\$110.92	\$113.26	\$115.65	\$118.00	\$120.55	\$123.04	\$125.52	\$128.05	\$130.23
Imported Crude Oil High Price Case	\$97.85	\$121.10	\$131.98	\$140.54	\$143.23	\$145.99	\$149.07	\$152.17	\$155.32	\$158.61	\$161.97	\$165.44	\$169.23	\$172.97	\$176.74	\$180.67	\$184.55	\$188.51	\$192.57
Imported Crude Oil Low Price Case	\$97.86	\$83.41	\$77.49	\$72.60	\$67.84	\$67.59	\$67.44	\$67.55	\$67.78	\$68.04	\$68.30	\$68.56	\$68.80	\$68.98	\$69.12	\$69.28	\$69.48	\$69.70	\$69.99
\$2012	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Imported Crude Oil Reference Price Case	\$132.65	\$135.39	\$138.31	\$141.36	\$144.51	\$147.82	\$150.98	\$154.46	\$157.93	\$161.47	\$165.09	\$168.80	\$172.58	\$176.45	\$180.40	\$184.45	\$188.58	\$192.81	\$197.13
Imported Crude Oil High Price Case	\$196.85	\$201.20	\$205.59	\$209.73	\$214.05	\$218.52	\$222.96	\$227.77	\$232.76	\$237.66	\$242.67	\$247.78	\$252.99	\$258.32	\$263.76	\$269.31	\$274.98	\$280.77	\$286.68
Imported Crude Oil Low Price Case	\$70.53	\$70.83	\$71.08	\$71.26	\$71.18	\$71.57	\$71.81	\$72.25	\$72.29	\$72.49	\$72.70	\$72.91	\$73.12	\$73.33	\$73.54	\$73.75	\$73.96	\$74.17	\$74.39

Source: Energy Commission and U.S. Energy Information Administration



Proposed Refiner Acquisition Cost and Henry Hub Common Cases



Source: Energy Commission and U.S. Energy Information Administration



Petroleum Transportation Fuel Price Projection Methodology

- Use forecasted RAC in cents per gallon (Source: EIA's Annual Energy Outlook 2013)
- Establish and add a margin for regular grade gasoline, diesel, and jet fuel prices
 - ❑ RAC to ex-tax retail price margin (Reference, High, and Low)
- Add California and federal taxes and fees (excise and sales)
 - ❑ Uses the updated rates for the fuel tax structure outlined in the Board of Equalization's "Gas Tax Swap" and "Diesel Tax Swap", which took effect July 1, 2010 and July 1, 2011, respectively

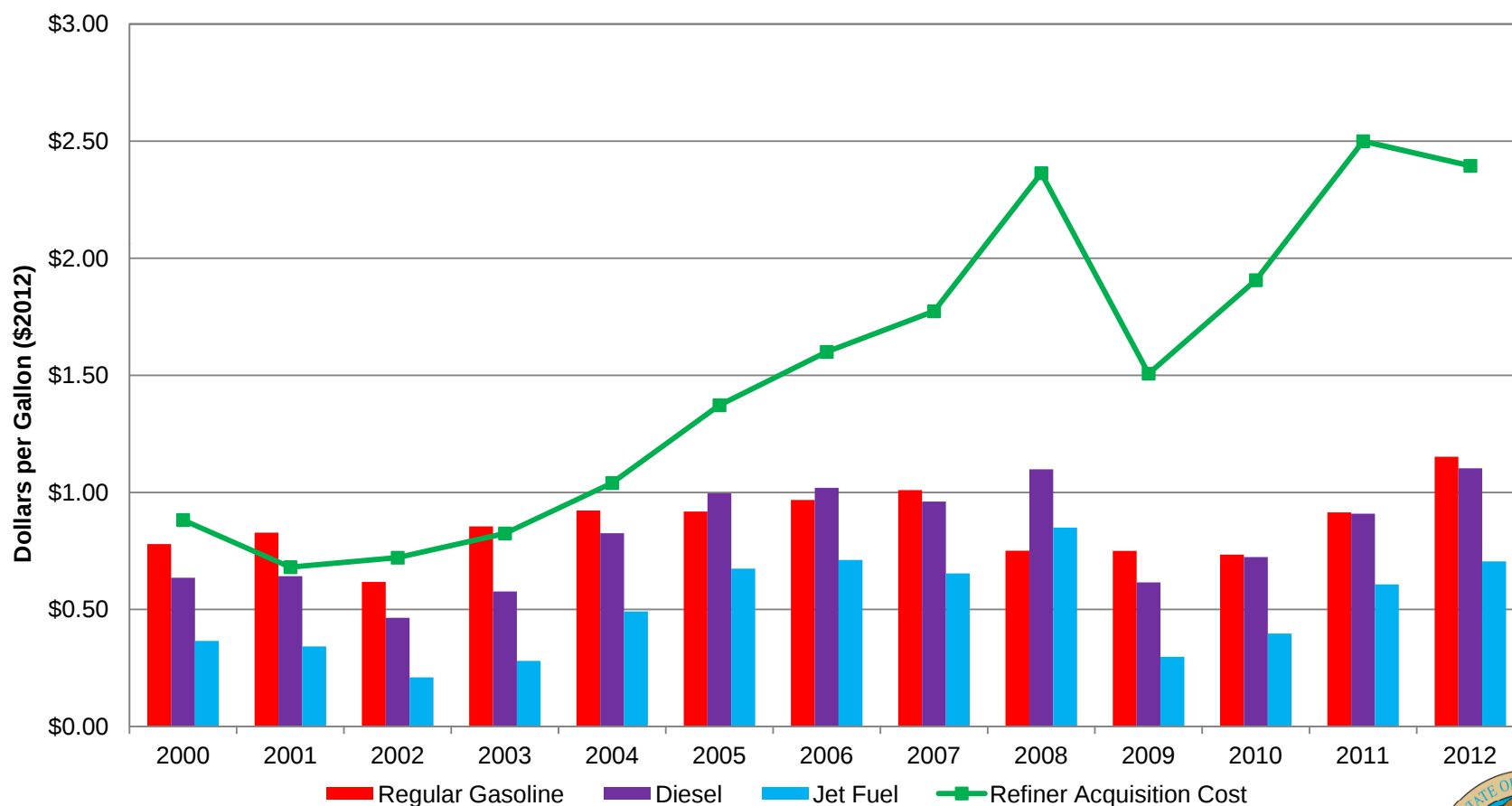


Assumptions

- In real terms, fuel margins are held constant
- California and federal excise taxes and fees are held constant in real terms
- Current RFG and diesel formulations remain constant throughout the projection
- Carbon prices and other government regulation influencing prices included as an additional adder (LCFS influence yet to be included)



California Gasoline, Diesel, Jet Fuel RAC-to-Retail Price Margins



Source: Energy Commission and U.S. Energy Information Administration



California Petroleum Transportation Fuel Price Margins & Taxes (2012 Cents)

	Regular Gasoline	Diesel	Jet Fuel
	Cents per Gallon		
High Case Margin	90.39	91.28	61.03
Reference Case Margin	86.91	85.83	55.15
Low Case Margin	79.95	74.94	43.39

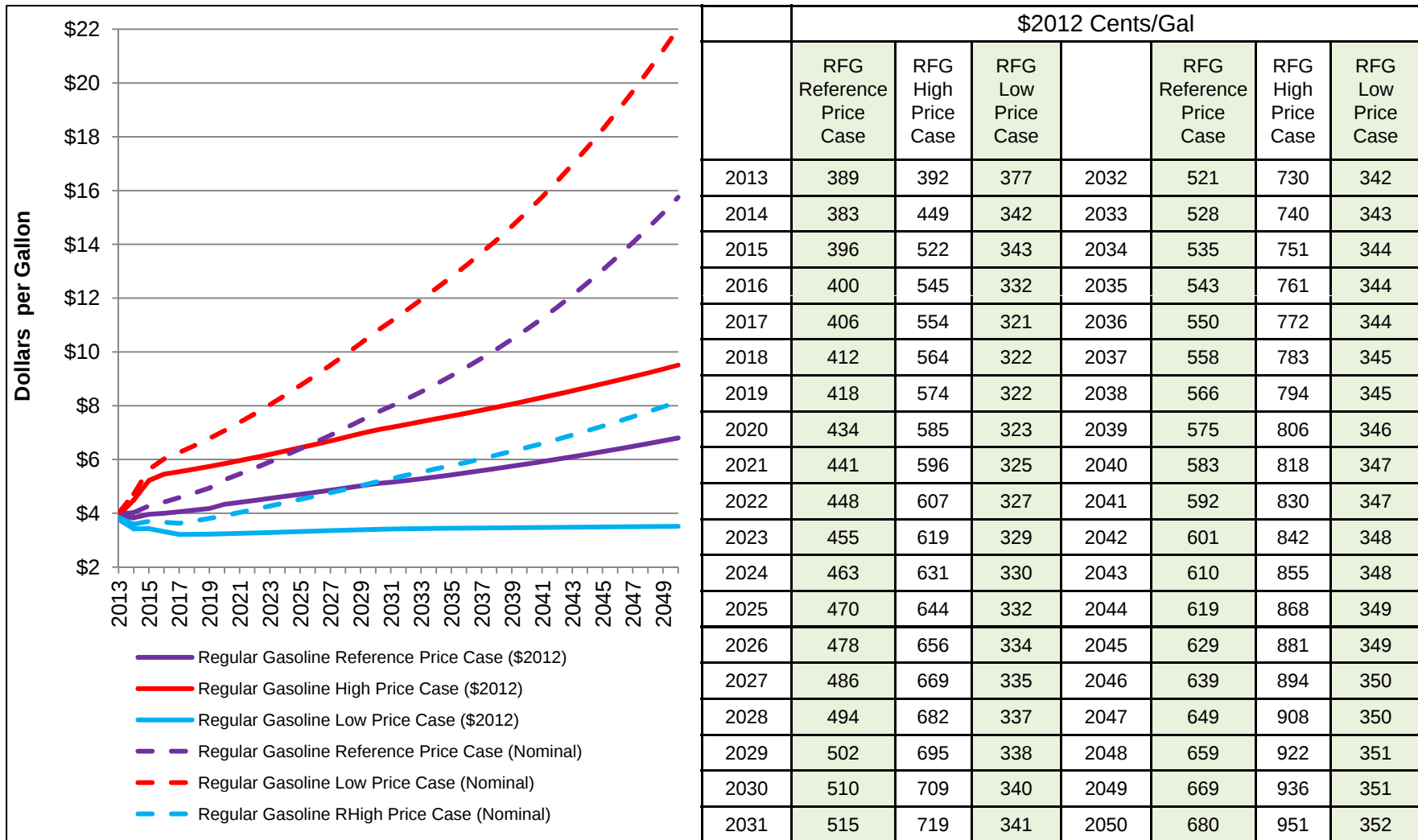
	FED Excise Tax	State Excise	State Sales Tax
Regular Gasoline	18.4	36	3.25%
Diesel	24.4	10	10.44%
Jet Fuel	Common Carrier Jet Fuel is tax exempt		

- Reference case margins was the average margin for a given fuel between 2003 and 2011
- High case margins were the average margin for a given fuel between 2003 and 2008
- Low case margins were the average margin for a given fuel between 2009 and 2011
- Projection uses fuel tax rates posted by the BOE effective July 2012 (see table to left)
- Gasoline and Diesel price projections include a 2 cent underground storage fee as well

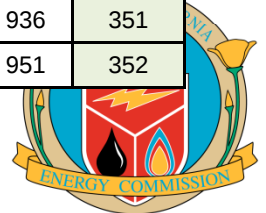
Source: Energy Commission and Board of Equalization



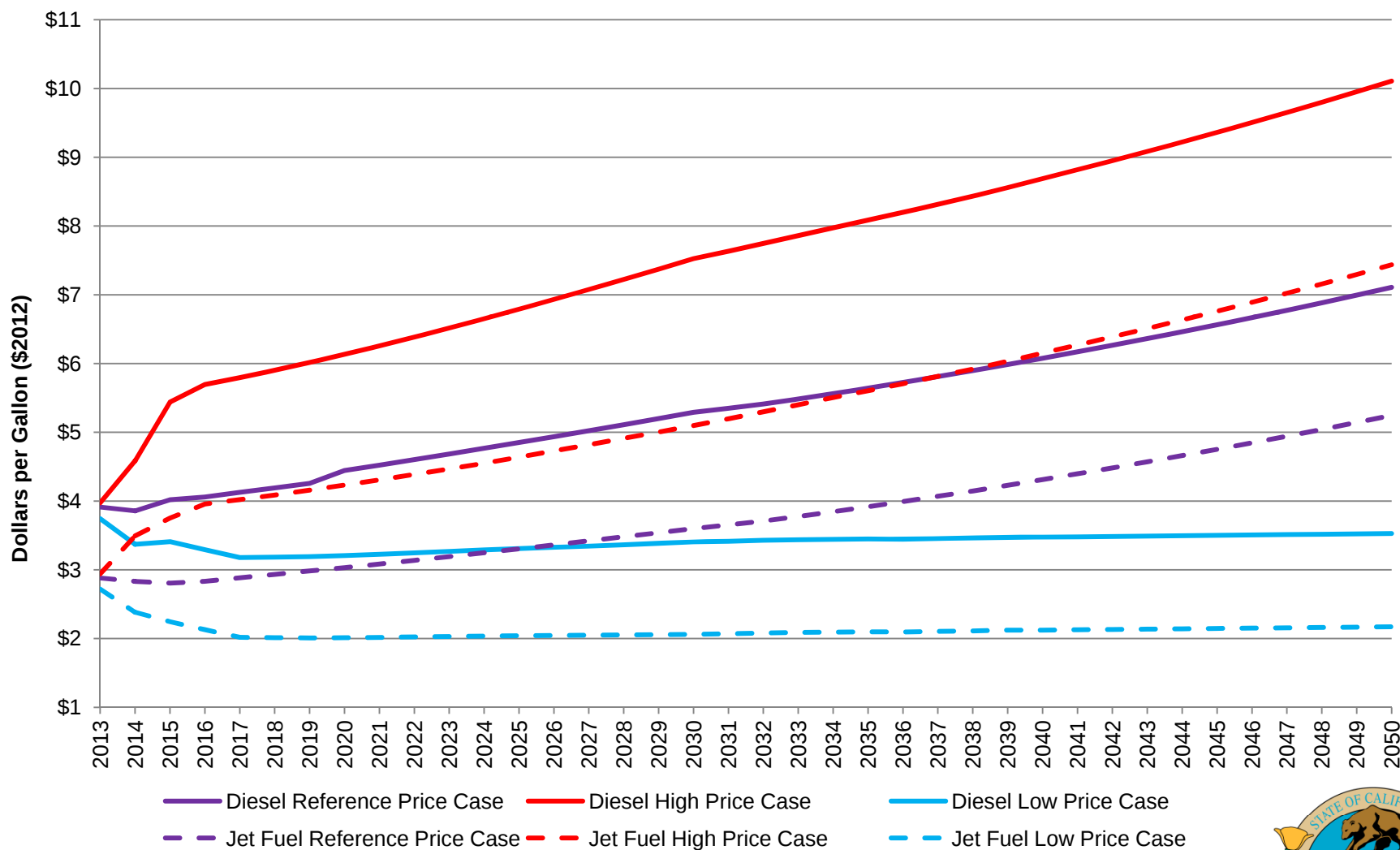
California Regular Gasoline Price Cases



Source: Energy Commission



California Diesel & Jet Fuel Price Cases



Source: Energy Commission



E85, B5, and Propane Price Projection Methodology

E85

- Based on reference, high, and low gasoline price cases
- Gasoline price cases are divided by 1.37 to price E85 on an equivalent energy basis

B5

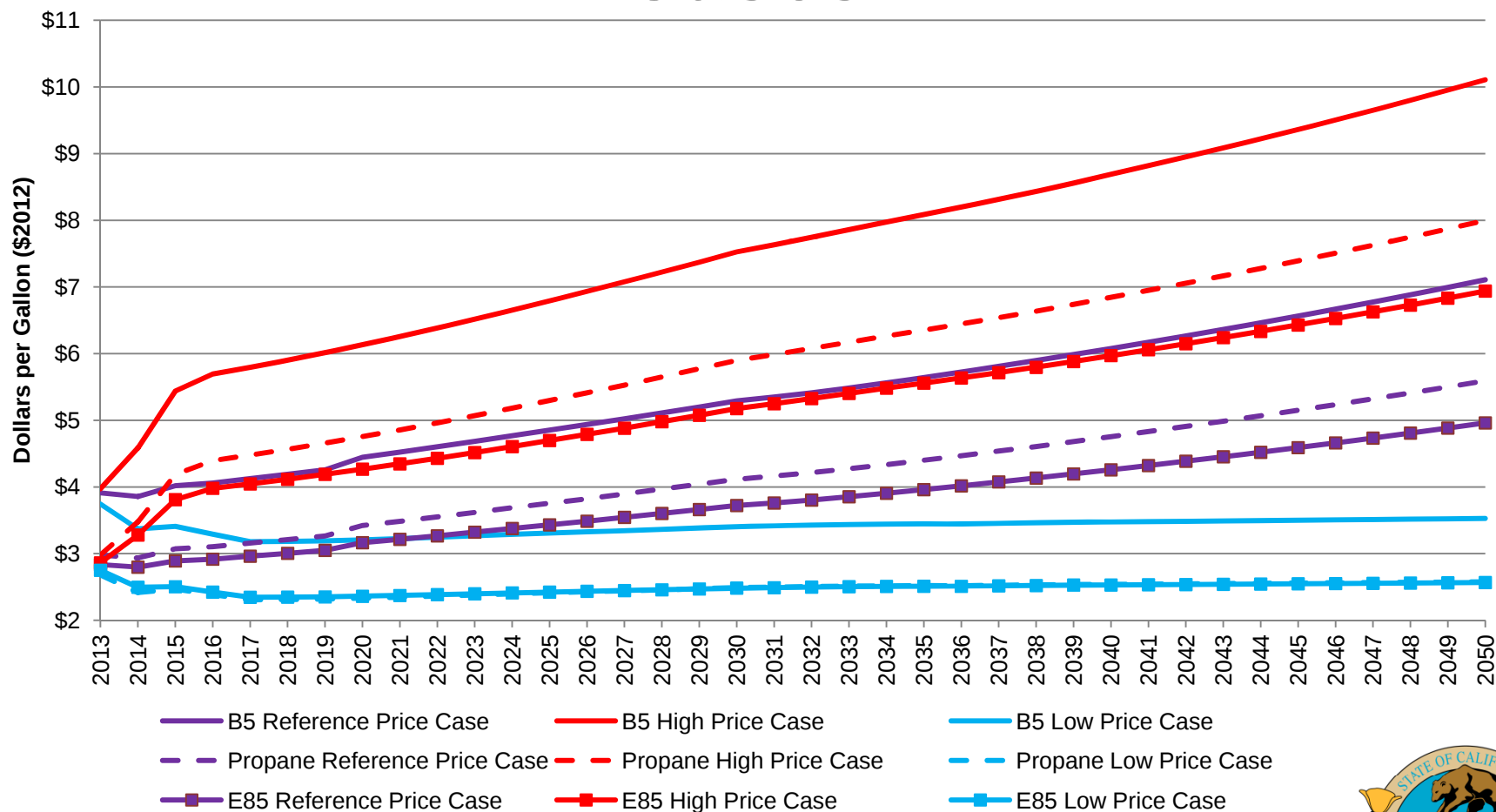
- Substitute for diesel
- Priced the same as diesel

Propane

- Uses high and low RAC price forecasts
- Crude to wholesale margins of 84% (high and reference) and 73% (low) price of crude oil with 58 cent retail margin
- Excise tax of 24.4 cents per gallon and sales tax of 8.25%



California E85, B5, and Propane Price Cases



Source: Energy Commission



Price Cases for Transportation Natural Gas, Electricity, and Hydrogen

- Staff will continue to use the fixed margin methodology established in the *2009 Integrated Energy Policy Report*
- CNG and Hydrogen fuels will use natural gas projections provided by the Natural Gas Unit of the Electricity Supply Office
- Electricity prices are based on rate projections from the Demand Analysis Office

CNG

- CA PG&E Hub price cases used with hub to retail margins of \$1.32 (Ref), \$1.45 (High), \$1.13 (Low) per therm
- Federal road excise tax of \$.184 per GGE and 8.25% California sales tax

Electricity

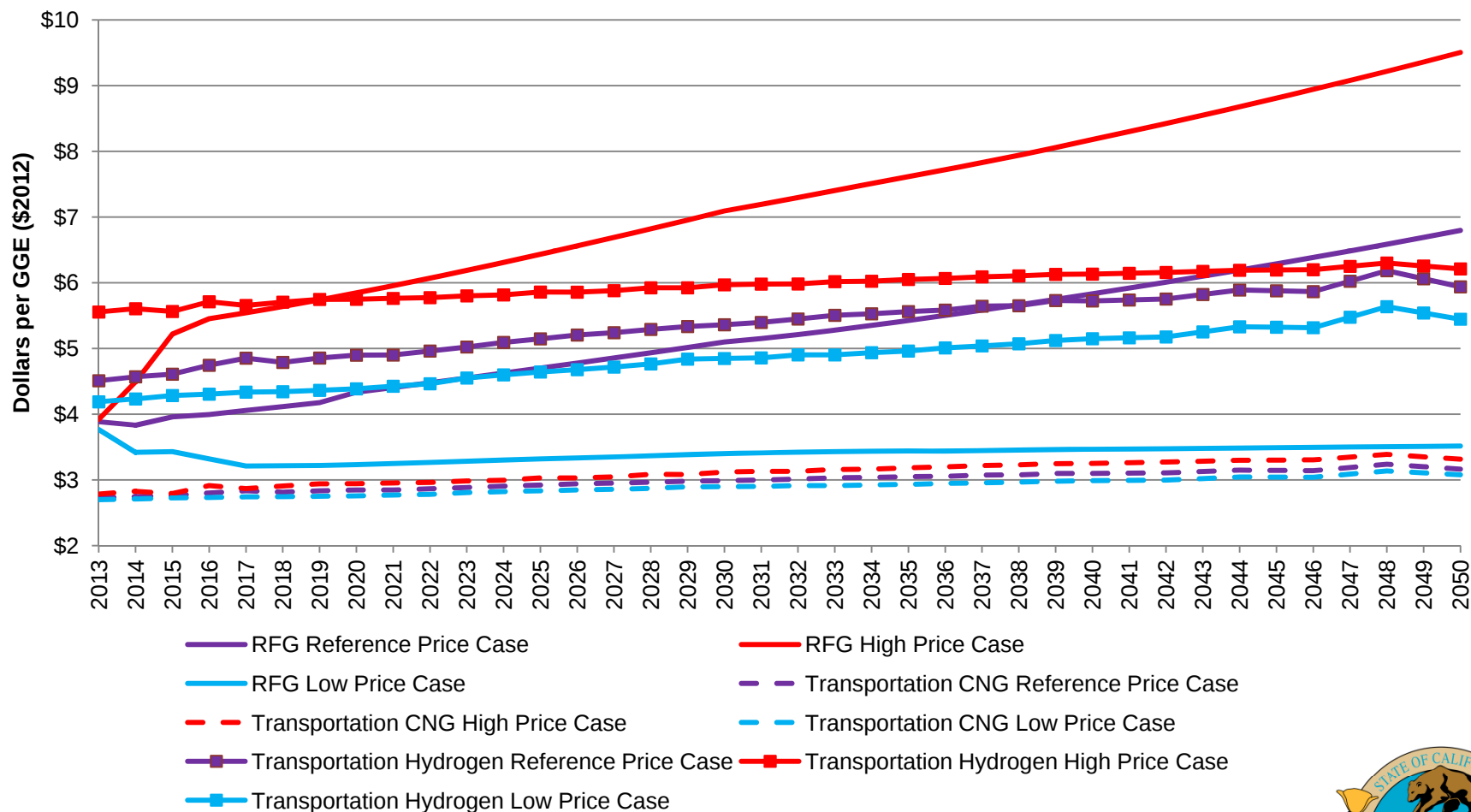
- GGE conversions of DAO's retail price projections

Hydrogen

- Same CA PG&E Hub price cases as CNG
- Reference and Low case use margins provided by a 2009 EIA study on Hydrogen Prices (H2A, 2012) with a \$2.46 Reference and \$2.26 Low margin with a .39 multiplier to turn NG into wholesale Hydrogen
- High Case uses \$3.06 margin and a .24 reforming adder
- 8.25% California sales tax



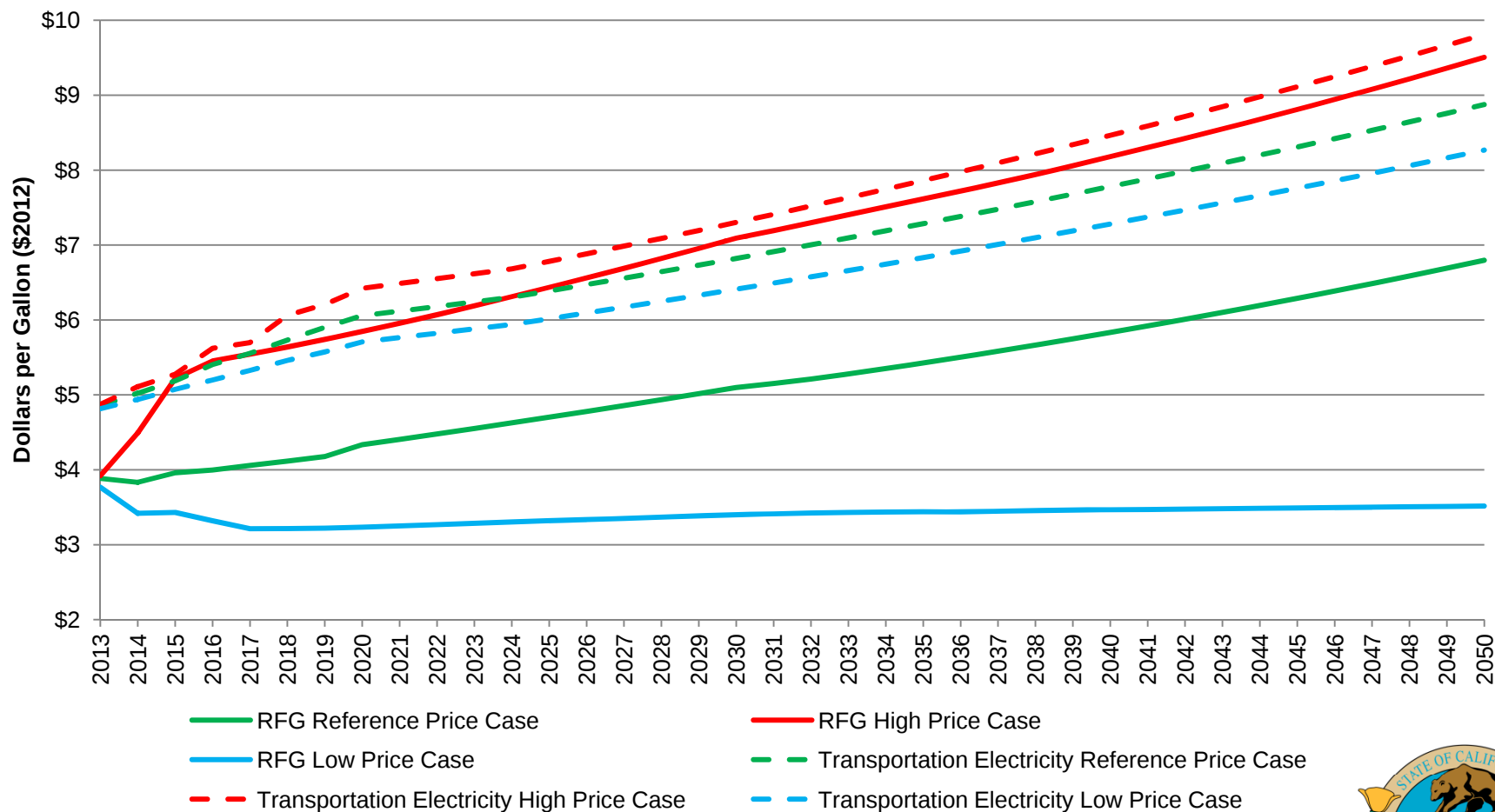
California Transportation CNG, Hydrogen and Gasoline Price Cases



Source: Energy Commission



California Transportation Electricity & Gasoline Price Cases



Source: Energy Commission

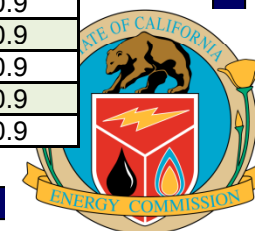


EIA 2013 Annual Energy Outlook

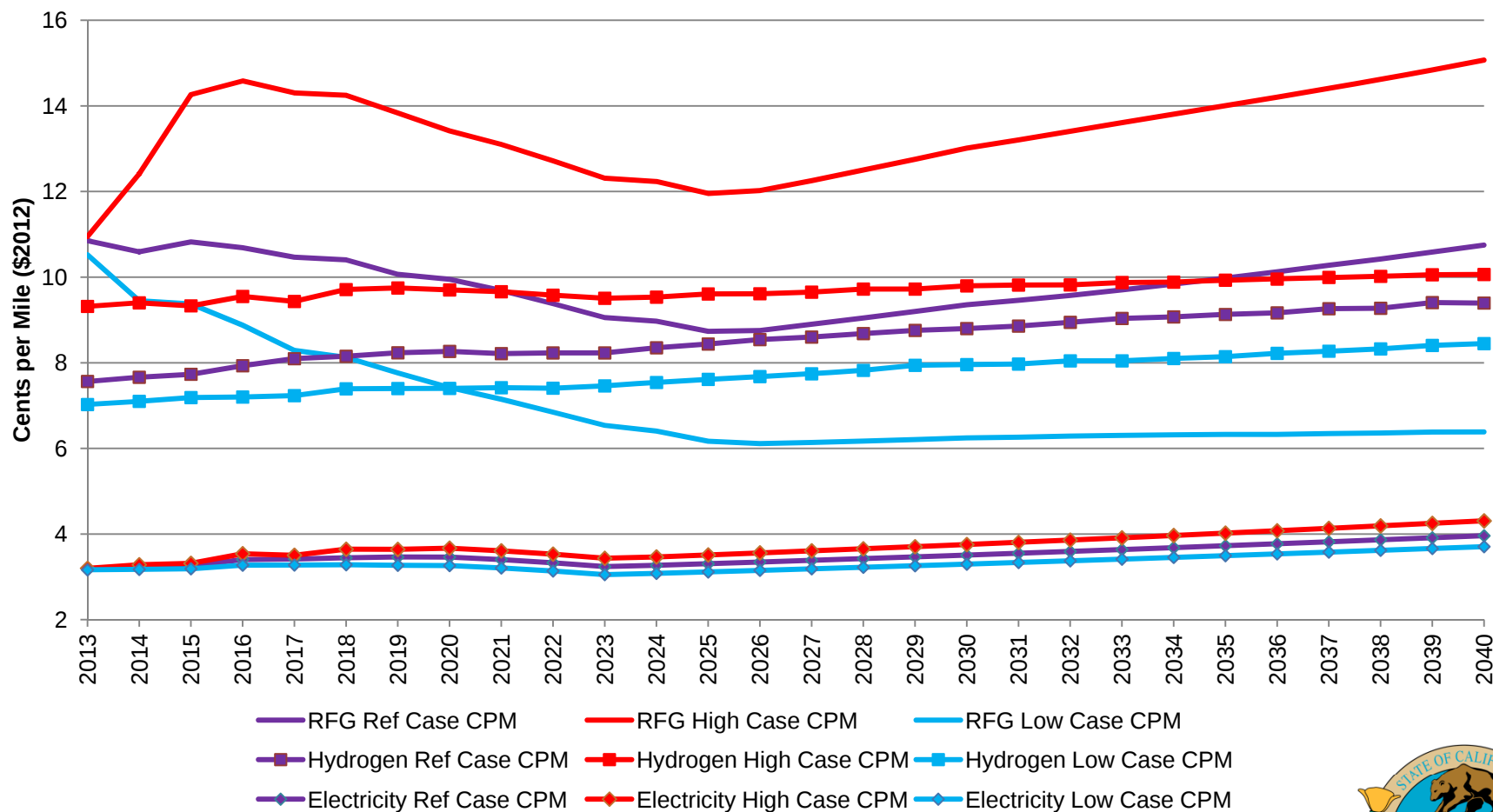
MPGGE Projections for New Vehicles

- Cost per mile traveled is one of the main determinants of vehicle choice and travel
- Some fuels which are more expensive than gasoline in energy terms become less expensive in cost per mile terms
- Table displays EIA's recent reference case projections of new compact vehicle MPG

GGE	Gasoline	Turbo Direct Injection Diesel	Compressed Natural Gas	100 Mile Electric Vehicle	Fuel Cell Hydrogen
2013	35.8	44.8	38.6	152.2	59.6
2014	36.2	45.1	39.0	155.6	59.6
2015	36.6	45.4	39.4	159.1	59.6
2016	37.4	46.2	40.3	158.8	59.8
2017	38.8	47.1	41.8	162.6	60.0
2018	39.6	47.7	42.7	166.3	58.8
2019	41.5	49.2	44.8	170.4	59.0
2020	43.6	50.7	47.1	175.0	59.3
2021	45.5	52.0	49.2	179.8	59.7
2022	47.7	53.2	52.0	185.6	60.3
2023	50.3	54.6	54.7	192.7	61.0
2024	51.6	55.4	56.2	192.9	61.0
2025	53.8	56.9	58.6	193.2	61.0
2026	54.6	57.3	59.3	193.3	60.9
2027	54.6	57.3	59.4	193.6	60.9
2028	54.6	57.3	59.3	193.9	60.9
2029	54.5	57.3	59.3	194.2	60.9
2030	54.5	57.2	59.3	194.5	60.9
2031	54.5	57.2	59.3	194.7	60.9
2032	54.4	57.2	59.2	194.9	60.9
2033	54.4	57.2	59.2	195.1	60.9
2034	54.4	57.1	59.2	195.3	60.9
2035	54.4	57.1	59.1	195.5	60.9
2036	54.4	57.1	59.1	195.7	60.9
2037	54.3	57.1	59.1	195.9	60.9
2038	54.3	57.1	59.1	196.1	60.9
2039	54.3	57.0	59.0	196.3	60.9
2040	54.3	57.0	59.0	196.4	60.9



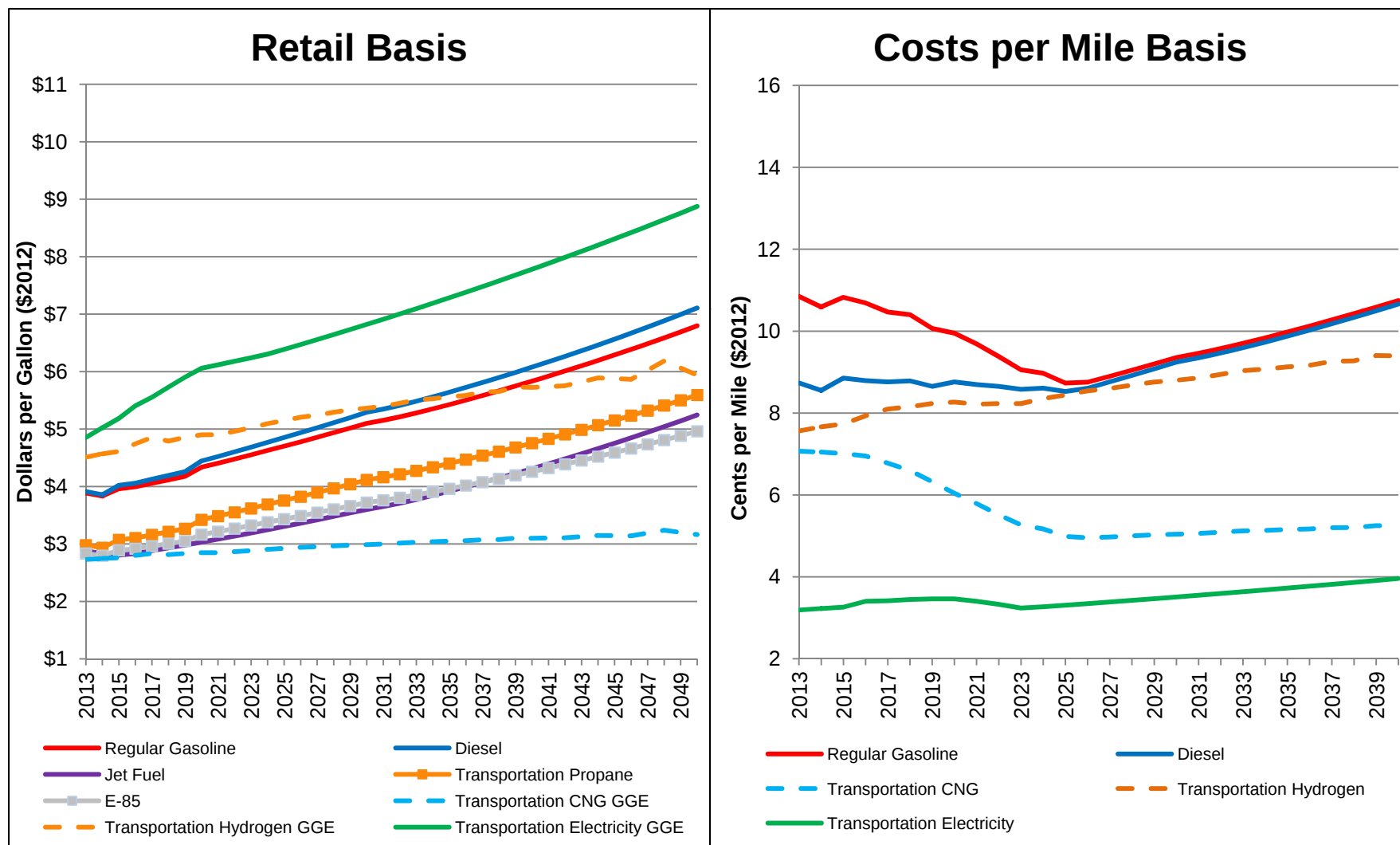
Gasoline, Hydrogen, and Electricity Cost Per Mile Cases



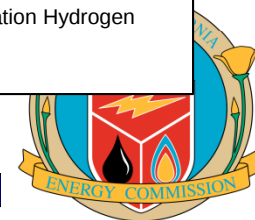
Source: Energy Commission



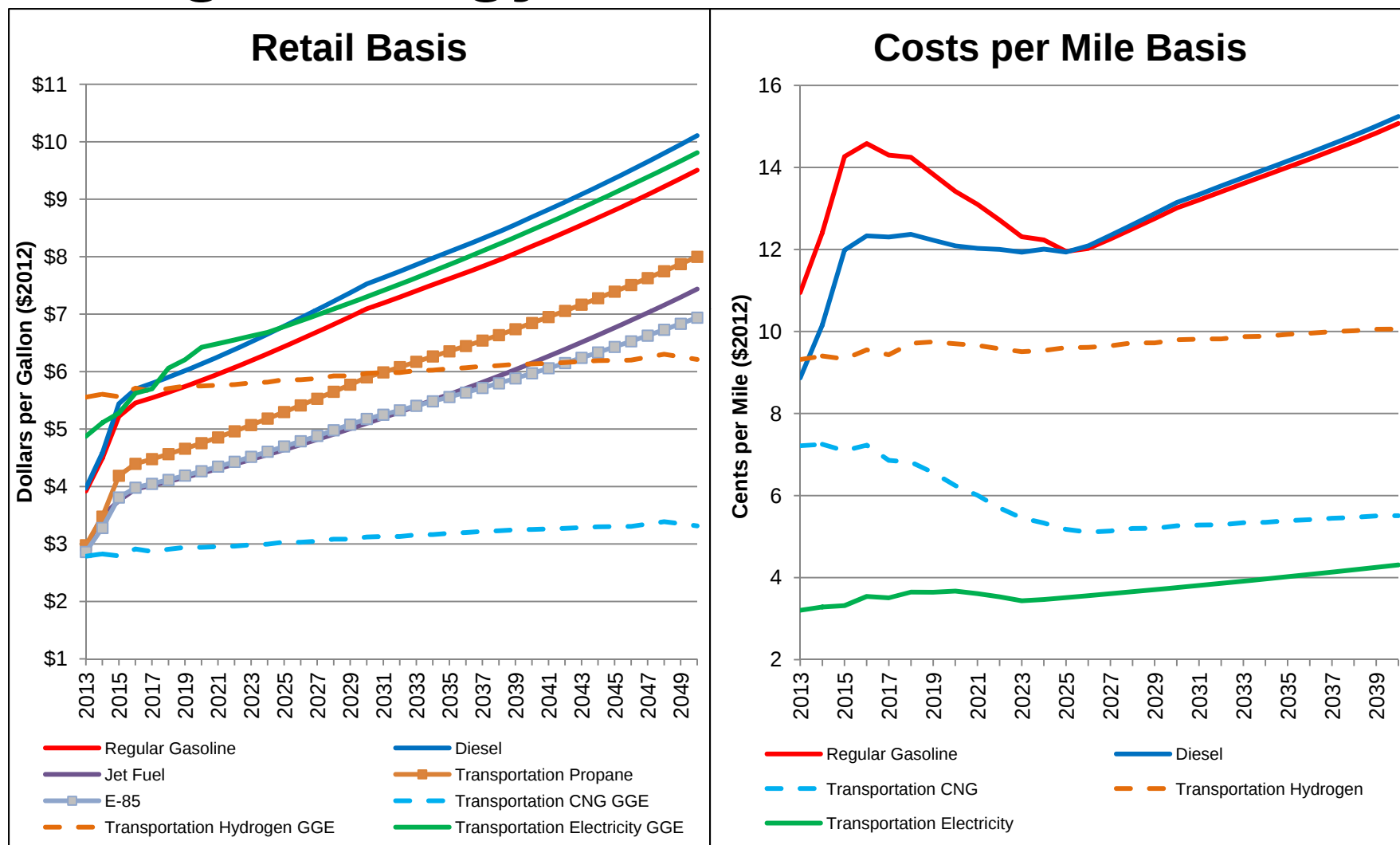
Reference Common Case



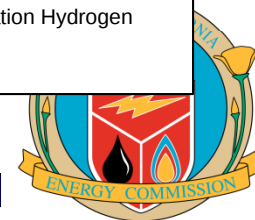
Source: Energy Commission



High Energy Price Common Case

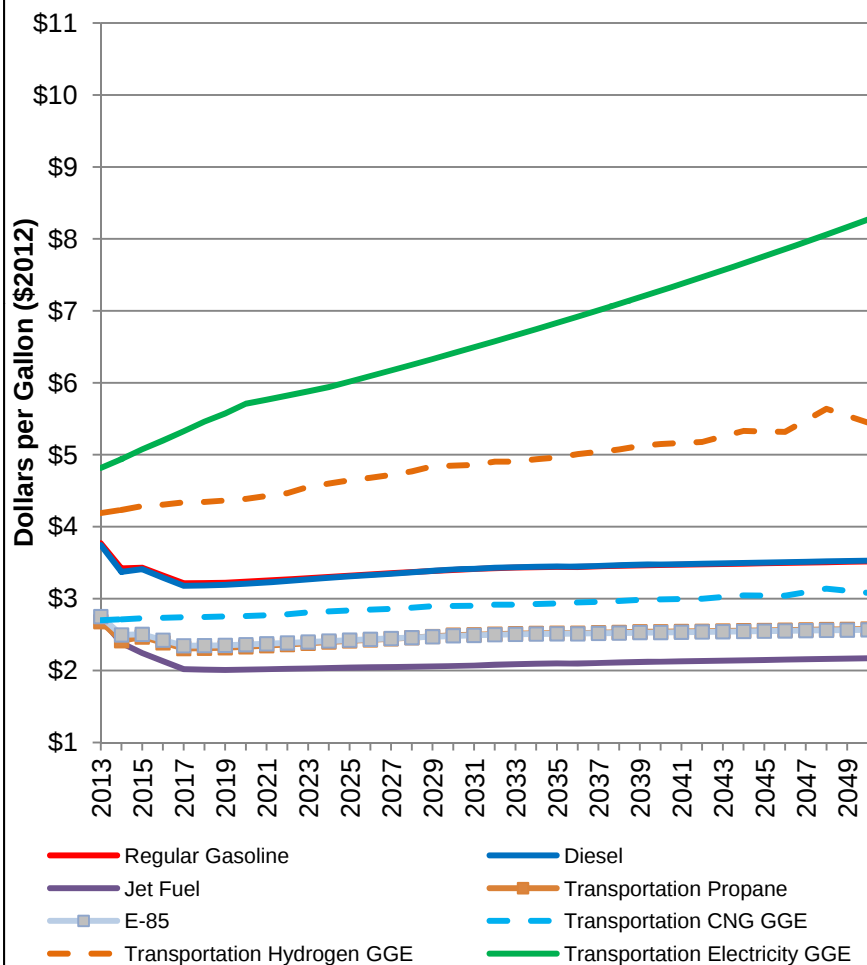


Source: Energy Commission

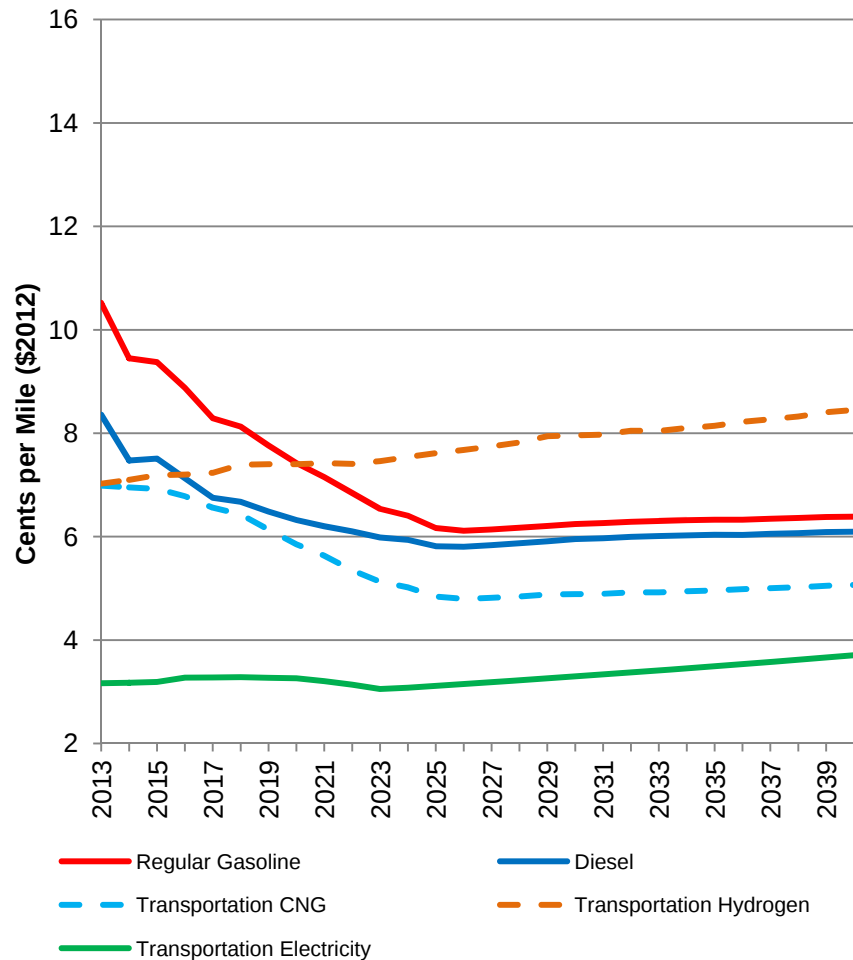


Low Energy Price Common Case

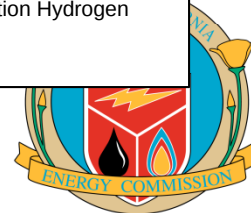
Retail Basis



Costs per Mile Basis

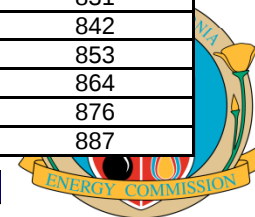


Source: Energy Commission



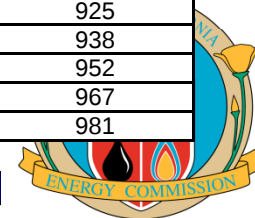
Transportation Reference Price Cases

\$2012	Regular Gasoline	Diesel	Jet Fuel	Propane	E-85	Transportation CNG (GGE)	Transportation Hydrogen (GGE)	Transportation Electricity (GGE)
2013	389	391	288	298	284	273	451	485
2014	383	386	283	293	280	275	457	502
2015	396	402	281	307	289	276	461	519
2016	400	406	283	310	292	280	475	540
2017	406	413	288	316	296	283	485	555
2018	412	419	293	321	301	281	479	573
2019	418	426	298	327	305	283	486	590
2020	434	444	303	342	316	285	490	606
2021	441	452	308	349	322	285	490	612
2022	448	460	314	355	327	287	496	618
2023	455	468	319	362	332	289	502	624
2024	463	477	325	369	338	291	509	630
2025	470	485	331	376	343	292	515	639
2026	478	493	336	382	349	294	521	647
2027	486	502	342	390	355	295	524	656
2028	494	511	348	397	360	297	529	664
2029	502	520	354	404	366	298	534	673
2030	510	529	360	412	372	299	536	682
2031	515	535	365	416	376	300	540	691
2032	521	541	371	421	380	302	545	700
2033	528	548	377	427	385	303	551	710
2034	535	556	384	434	391	304	553	719
2035	543	564	392	440	396	305	556	728
2036	550	572	399	447	402	306	559	738
2037	558	581	407	454	408	307	564	748
2038	566	589	415	461	413	308	565	758
2039	575	599	423	468	420	310	573	768
2040	583	608	431	476	426	310	573	778
2041	592	617	440	483	432	310	574	788
2042	601	627	448	491	439	311	575	799
2043	610	636	457	499	445	313	582	809
2044	619	646	466	507	452	315	589	820
2045	629	656	475	515	459	315	588	831
2046	639	667	485	524	466	314	587	842
2047	649	677	494	532	473	319	603	853
2048	659	688	504	541	481	324	618	864
2049	669	699	514	550	488	320	606	876
2050	680	711	525	559	496	316	594	887



Transportation High Price Cases

\$2012	Regular Gasoline	Diesel	Jet Fuel	Propane	E-85	Transportation CNG (GGE)	Transportation Hydrogen (GGE)	Transportation Electricity (GGE)
2013	392	397	294	298	286	279	556	487
2014	449	458	349	348	328	283	561	511
2015	522	544	375	419	381	279	556	528
2016	545	569	396	440	398	291	571	562
2017	554	580	402	448	405	287	566	570
2018	564	590	409	456	412	291	571	606
2019	574	602	416	466	419	294	575	621
2020	585	613	423	476	427	294	575	642
2021	596	626	431	486	435	295	576	649
2022	607	638	439	496	443	296	577	655
2023	619	652	447	507	452	299	580	662
2024	631	665	455	518	461	300	582	668
2025	644	679	464	530	470	303	586	678
2026	656	693	473	541	479	303	586	688
2027	669	707	482	553	488	305	588	699
2028	682	722	491	565	498	308	593	709
2029	695	737	500	577	508	308	592	719
2030	709	753	510	590	518	312	597	730
2031	719	763	520	599	525	313	598	741
2032	730	775	530	608	533	313	598	752
2033	740	786	540	617	540	316	602	763
2034	751	798	551	626	548	316	602	775
2035	761	808	560	635	556	319	605	786
2036	772	820	571	645	564	320	607	798
2037	783	832	581	654	572	322	609	810
2038	794	843	592	664	580	323	611	822
2039	806	856	603	674	588	325	613	834
2040	818	869	615	685	597	325	613	846
2041	830	882	627	695	606	326	614	859
2042	842	895	639	706	615	327	616	872
2043	855	908	651	717	624	329	617	885
2044	868	922	663	728	633	330	619	898
2045	881	936	676	739	643	330	620	911
2046	894	950	689	751	653	331	620	925
2047	908	965	702	763	663	335	625	938
2048	922	980	716	775	673	339	630	952
2049	936	995	730	787	683	335	626	967
2050	951	1011	744	800	694	332	621	981



Transportation Low Price Cases

\$2012	Regular Gasoline	Diesel	Jet Fuel	Propane	E-85	Transportation CNG (GGE)	Transportation Hydrogen (GGE)	Transportation Electricity (GGE)
2013	377	374	272	268	275	270	419	482
2014	342	337	238	242	250	271	423	494
2015	343	341	224	247	250	273	429	507
2016	332	329	213	239	242	273	431	520
2017	321	318	202	231	235	274	434	533
2018	322	318	201	231	235	274	434	546
2019	322	319	201	232	235	275	436	557
2020	323	321	201	233	236	276	439	571
2021	325	323	202	235	237	277	443	577
2022	327	325	202	236	239	278	446	582
2023	329	327	203	238	240	281	455	588
2024	330	329	204	240	241	282	460	594
2025	332	331	204	241	242	284	464	602
2026	334	333	205	243	244	285	468	609
2027	335	334	205	244	245	286	472	617
2028	337	336	205	246	246	287	477	625
2029	338	339	206	247	247	290	484	633
2030	340	341	206	249	248	290	485	641
2031	341	342	207	250	249	290	486	649
2032	342	343	208	251	250	291	490	658
2033	343	344	209	251	250	291	490	666
2034	344	344	209	252	251	293	494	675
2035	344	345	210	252	251	293	496	683
2036	344	345	210	252	251	295	501	692
2037	345	346	211	253	252	296	504	701
2038	345	346	211	253	252	297	507	710
2039	346	347	212	254	253	298	512	719
2040	347	347	212	254	253	299	515	728
2041	347	348	213	254	253	299	516	737
2042	348	348	213	255	254	300	518	747
2043	348	349	214	255	254	302	525	756
2044	349	350	214	255	254	304	533	766
2045	349	350	215	256	255	304	532	776
2046	350	351	215	256	255	304	532	786
2047	350	351	216	257	256	309	548	796
2048	351	352	216	257	256	314	564	806
2049	351	352	217	257	256	311	554	816
2050	352	353	217	258	257	308	545	827

