International Transportation Energy Demand Determinants (ITEDD): Prototype Results for China

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Dawn of new global oil market paradigm?

- Conventional wisdom has centered around $100-120/barrel oil and 110-115 million b/d global liquid fuel demand in the long term (2030-2040)

- Demand in non-OECD may push global demand higher

- Technological developments in exploration and production can support this higher demand, based on current trends

- New abundance of hydrocarbons…but at what price?

- Current EIA work is exploring 'new abundance' paradigm: ***higher global demand at higher—but only somewhat higher—world oil price***

New EIA global model of transportation fuel demand is designed to quantify key demand determinants

- International Transportation Energy Demand Determinants (ITEDD) operates within EIA's World Energy Projection System (WEPS) to develop International Energy Outlook

- Structural model with vehicle capital stock and modal choice elements, coupled with 'macro' and 'micro' level determinants

- Designed to allow analysis of multiple factors in consistent overall framework

- Economic, technological, behavioral and regulatory aspects

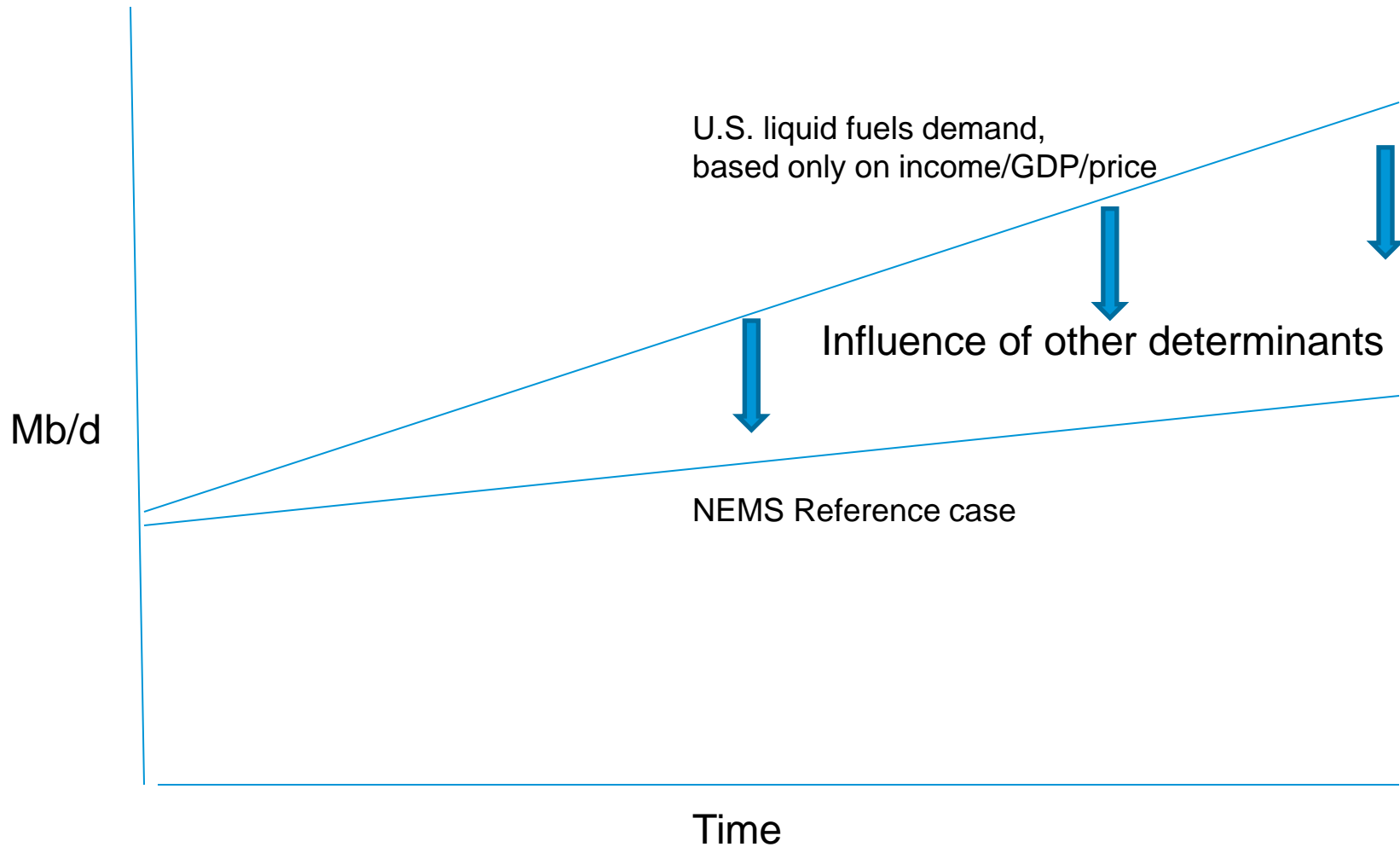- ***Key question: Chinese demand for fuel as incomes rise***

ITEDD Project Scope and Partners

- Objective: Replace current WEPS+ module for use in *IEO2015*

- Milestones:

  - *Project plan, January 2013*

  - *Scoping meetings, March-May 2013*

  - *Technical Requirements Analysis, June 2013*

  - *Project team funded and operating, September 2013*

  - *Component Design Report, Feb-June 2014*

  - *Model prototyping (China region), Feb-June 2014*

  - **Model build-out and testing, currently in progress**

  - Integration for IEO2015 runs, reporting and analysis

- Partners: IEA, MIT China Project, Leidos, OnLocation

Determinants of fuel demand are varied, and many are not well-suited to highly aggregate modeling

- 'Macro' determinants
  - Population
  - Employment
  - Income
  - Fuel Prices

- 'Structural' determinants
  - Vehicle ownership
  - Driving behavior
  - Work vs. leisure vs. errands
  - Urban form
  - Congestion, road capacity
  - Regulatory limits
  - Culture/history

Literature-based demand elasticity projection and NEMS (U.S.) projection show impact of policy, technology, behavior

Mb/d

U.S. liquid fuels demand, based only on income/GDP/price

Influence of other determinants

NEMS Reference case

Time

ITEDD logic flow (main solution sequence)

1. Population (1a. Rural/Urban)
2. Macro output (2a. Employment 2b. Income/distribution)
3. Initial travel demand 'budget' (VMT/freight)
4. Modal choice (branches to modes)
5. New sales by vehicle class (if class defined for mode)
6. Vehicle stock profile
7. VMT per driver (using set of determinants and reconciled to 3)
8. Stock utilization

Key model feature: Defining demand determinants for steps 3 and 7 above; capability to examine and experiment with *variable determinant specifications*

Flow diagram: passenger travel
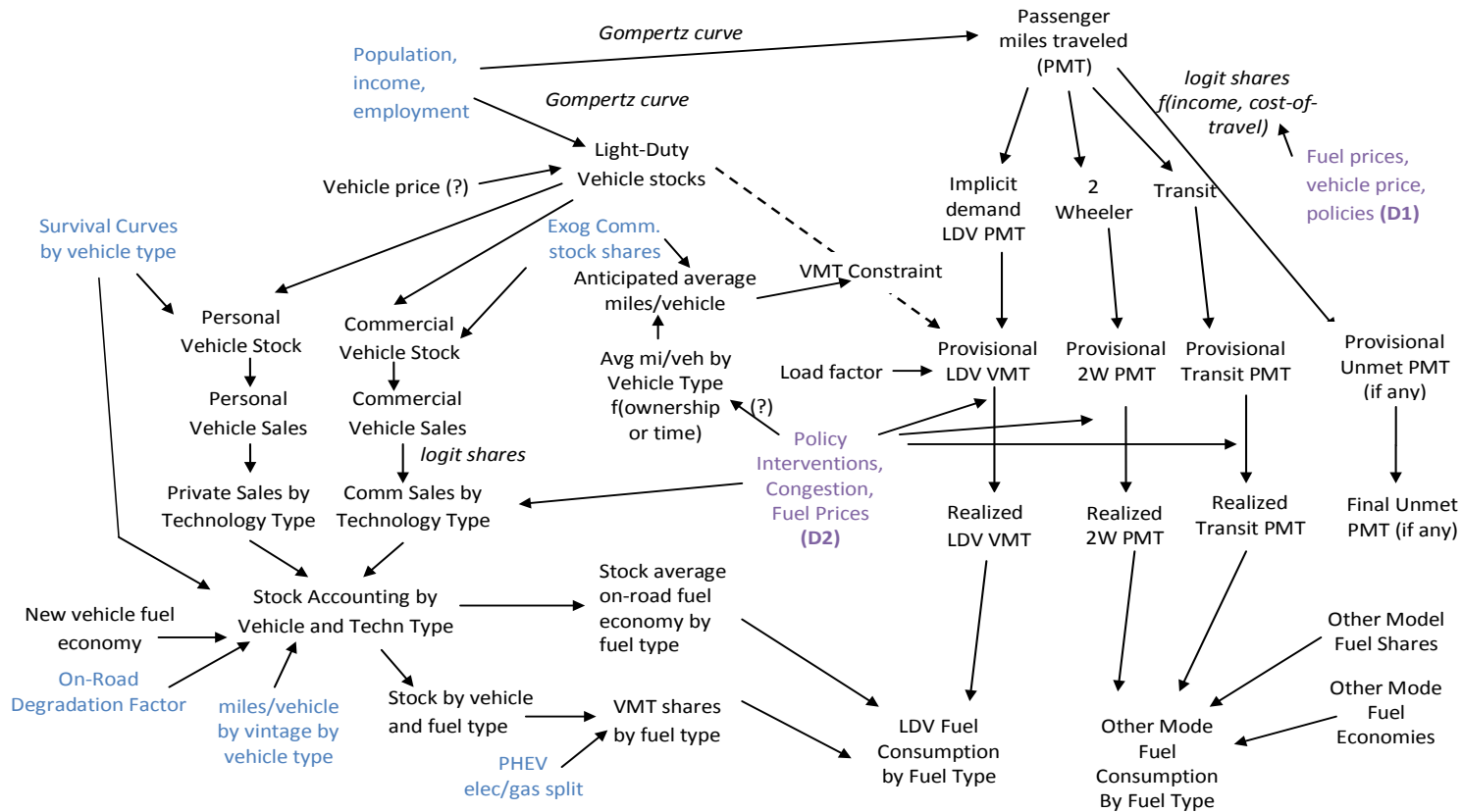
Vehicle types (2): commercial, personal (private)
Technology types (8): gasoline, diesel, natural gas, propane, other, EV, H2 fuel cell, PHEV
Fuels (9) are those in WEPS

Prototype ITEDD output: light duty vehicle demand, capital stock and utilization

1. LDVs			2010	2015	2020	2025	2030	2035	2040
Implicit Demand - LDV PKT	10	CHI	2069	3000	4396	6126	8389	10530	12063
Provisional LDV VKT - from Travel Demand	10	CHI	1116	1618	2371	3304	4525	5679	6506
LDV Stock Accounting									
Vehicle Stocks per capita	10	CHI	0.044	0.084	0.14	0.21	0.281	0.334	0.364
Vehicle Stocks	10	CHI	59	115	194	293	392	462	495
Benched Vehicle Stocks	10	CHI	63	120	199	298	397	466	500
Sales	10	CHI	15	16	21	28	32	30	29
LDV Kilometers per Vehicle	10	CHI	19029	15315	14586	14015	13593	13320	13148
Provisional LDV VKT - from Stocks	10	CHI	1206	1834	2904	4175	5394	6213	6579
Compare LDV VKT from Travel Demand to LDV VKT from Stocks									
Realized LDV VKT	10	CHI	1116	1618	2371	3304	4525	5679	6506
UnMet VKT	10	CHI	-91	-216	-534	-871	-870	-534	-73
UnMet VKT %	10	CHI	-0.08	-0.13	-0.23	-0.26	-0.19	-0.09	-0.01

ITEDD prototype projections show strong growth across entire projection period

Legend:
- Motor Gasoline
- Diesel
- Jet Fuel
- Liquid Petroleum Gas
- Electricity
- Natural Gas
- Renewables
- Hydrogen

X-axis: 2010, 2015, 2020, 2025, 2030, 2035, 2040