Electrification

Opportunities for multiple win wins?!

PRESENTED TO

Executive Forum:
Business Collaboration to Accelerate Electric Vehicle Markets

PRESENTED BY

Jurgen Weiss

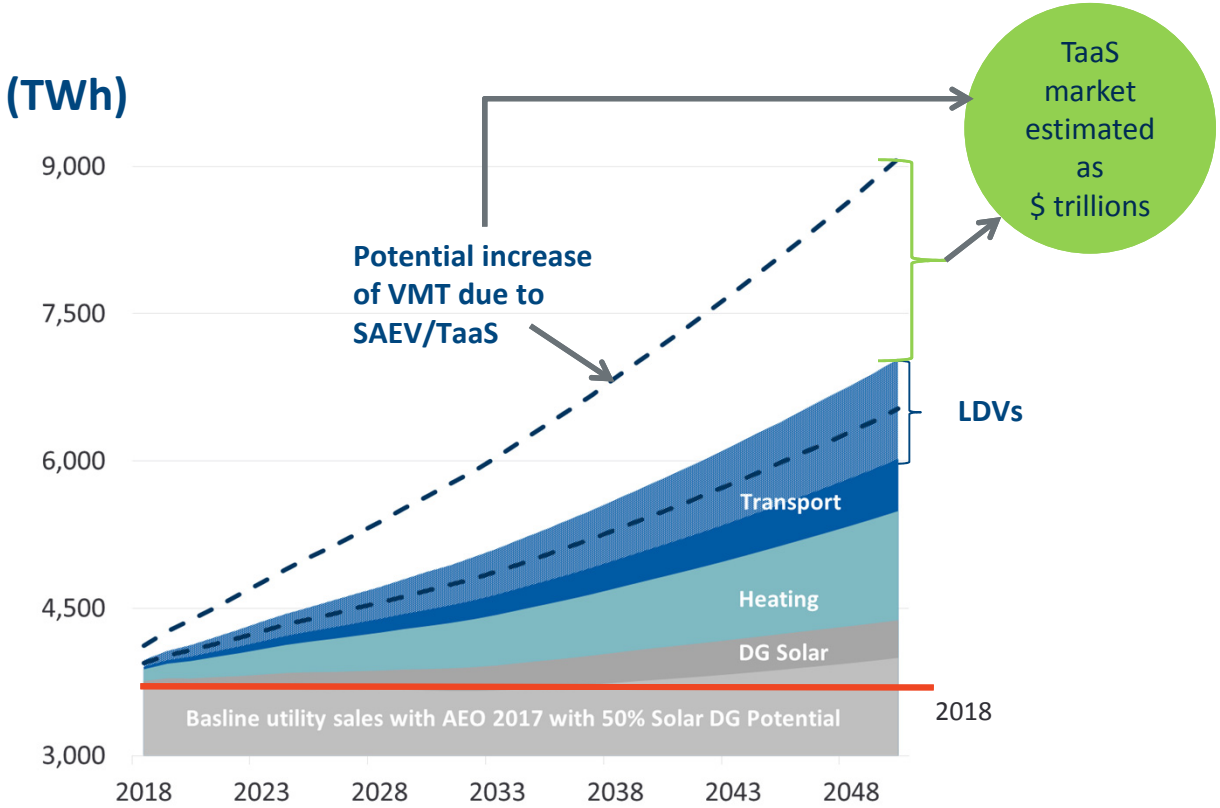
October 5, 2017

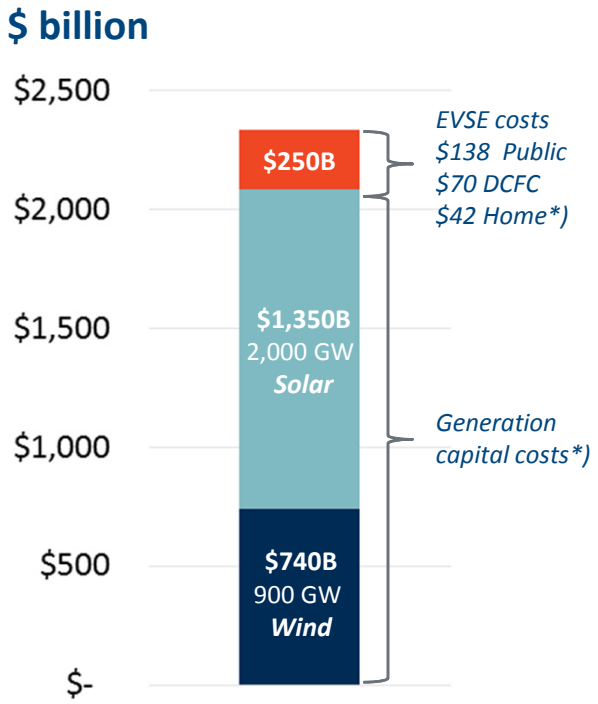
THE Brattle GROUP

Disclaimer

The views and opinions expressed in this presentation are strictly those of the author and do not necessarily represent the views or opinions of The Brattle Group or any of its other employees.

Electrification is a BIG opportunity for many





60-75% *or* ***3,000TWh potential increase*** *in sales relative to 2018*
Over 100% increase with higher VMT

Perhaps ***$2 trillion in investment*** *in solar and wind for a fully electrified green grid, plus perhaps* ***$250 billion*** *for EVSE*

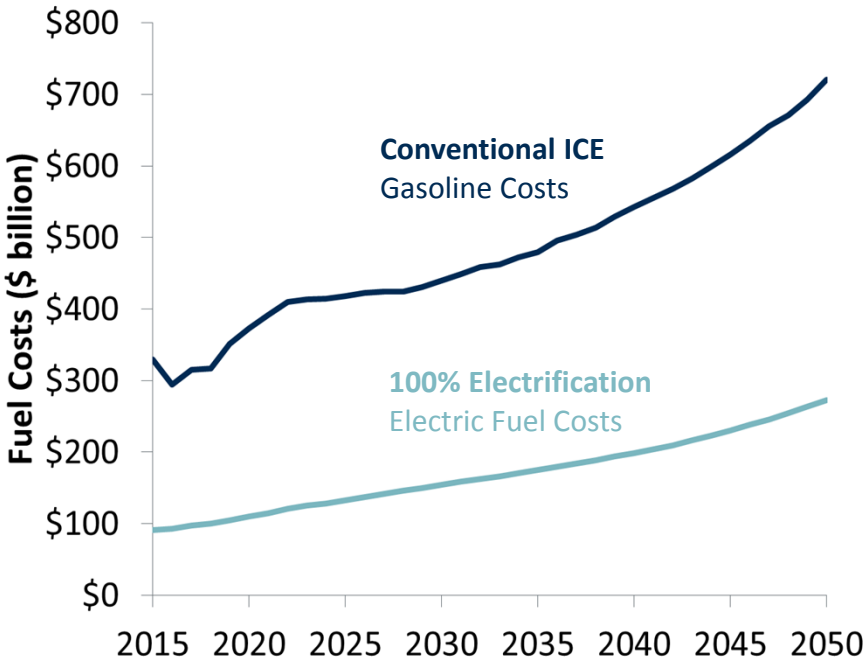
**) Caveat: Generation and EVSE costs are very rough estimates*

Sources: EIA AEO 2017, DOE, National Plug-In Electric Vehicle Infrastructure Analysis, US DOE, Sunshot: Q4 2016/Q1 2017 Solar Industry Update NREL: 2015 Cost of Wind Energy Review; PLUGGING AWAY: How to Boost Electric Vehicle Charging Infrastructure, June 2017, SCE, Charge Ready Pilot Program, Q1 2017 Report, issued May 31, 2017

Costs may be small compared to savings

Fuel cost savings alone are likely large compared to incremental EVSE investment needs.

Potential LDV Fuel Cost Comparison



Sources: EIA AEO 2017

$450 billion
fuel savings annually

$4.5 trillion
fuel savings over 10 years

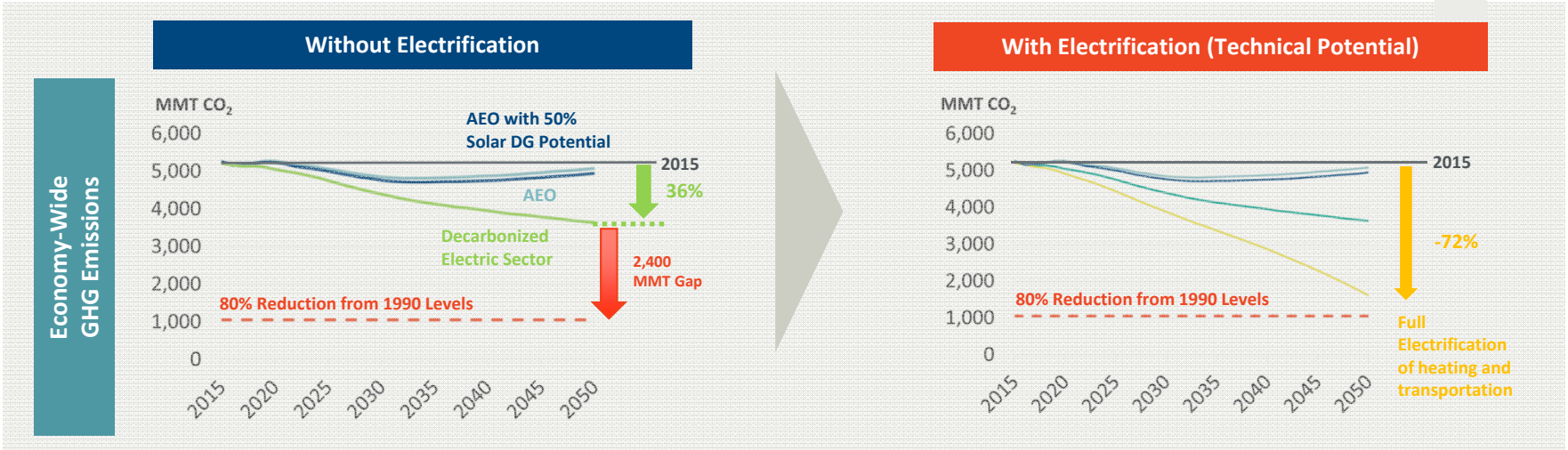
Savings are considerably larger than EVSE infrastructure costs
($250 billion/year)

Assumes predicted sticker price parity, but does not include many other private (lower maintenance, etc.) and social (including GHG) benefits.

Technology/preferences make electrification likely and desirable… and it is critical for GHG reduction

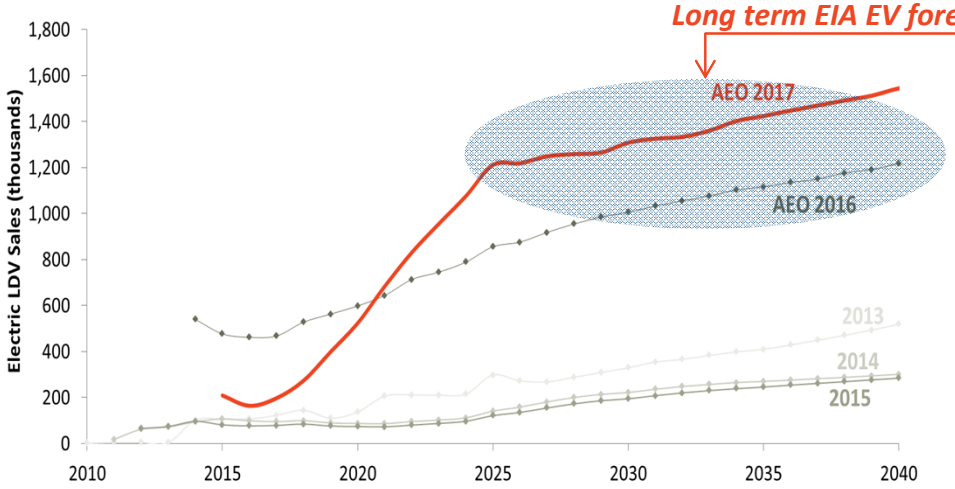
- Sharing Economy (Ride- and car sharing)
- New modes of transport (bikes, e-bikes,…)
- Autonomous driving
- EV technology and cost progress
- Changing role of cars as status symbol
- Urbanization
- Climate change

Electrification



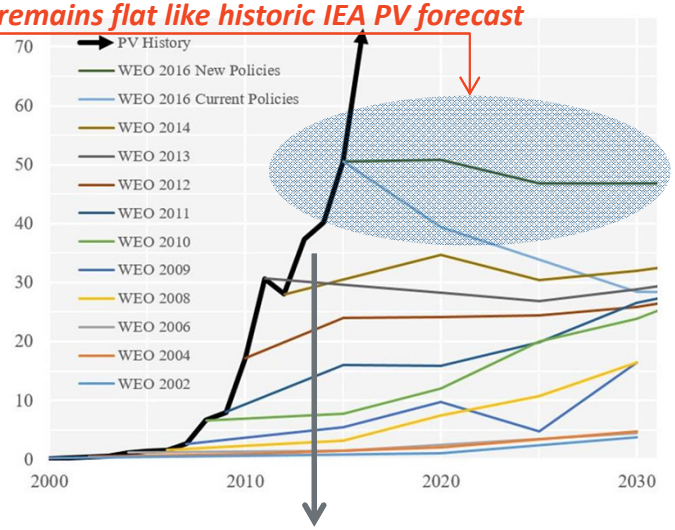
Electrification could happen way faster than you think

AEO Electric Light-Duty Vehicle Sales Forecasts

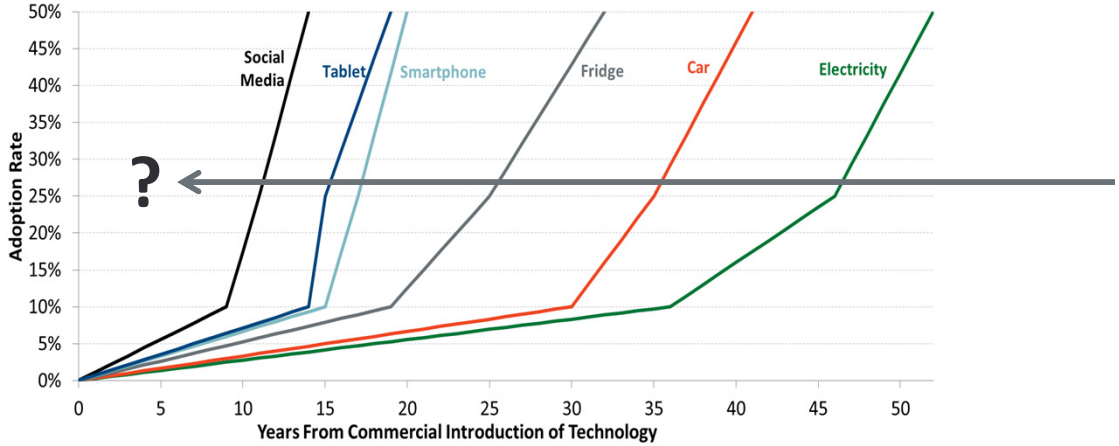


Historic IEA PV Projections over time

Long term EIA EV forecast remains flat like historic IEA PV forecast



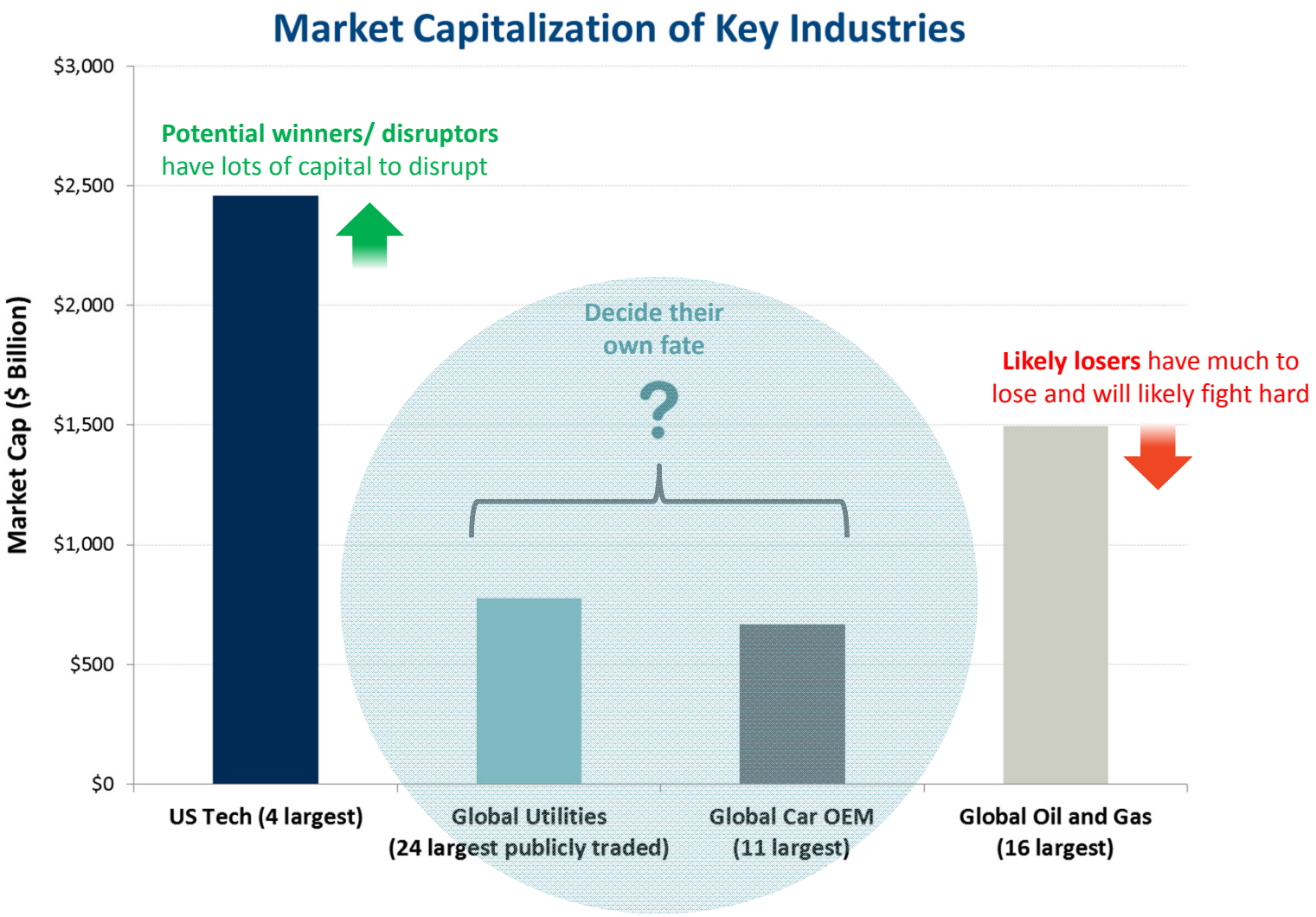
U.S. Adoption Rates By Technology



EV adoption likely even more like "tech" than PV

Sources: EIA AEO 2013-2017, http://www.mining.com/web/charts-energy-experts-hilariously-bad-forecasting-solar-installations/; https://www.linkedin.com/pulse/part-2-megaproject-paradox-what-chances-barrel-oil-being-john-noonan; Brattle analysis

There will be winners and losers – early action may decide who is who



Sources: Yahoo Finance, Bloomberg, based on October 2, 2017 values

Presenter Information

JURGEN WEISS

Principal | Boston/Rome

Jurgen.Weiss@brattle.com

+1.617.864.7900

Dr. Jurgen Weiss is a Principal of The Brattle Group and spearheads the firm's deep decarbonization and electrification initiatives. He advises utilities, governments and NGOs in North America, Europe, Asia and the Middle East on issues such as renewable energy economics and integration, energy efficiency, storage, carbon market design, the interaction between electricity, gas and transportation, and the impact these changes have on existing assets, market structures, and long-term planning.

He was a leading author of Brattle's recent report entitled "Electrification: Emerging Opportunities for Utility Growth". Jürgen has testified in U.S. state and federal courts, as well as in state regulatory proceedings on related issues. He has served on advisory councils as diverse as one for California's Low Carbon Fuel Standard, the U.S. Department of Energy's Wind Task Force and the King Abdullah City of Atomic and Renewable Energy in Saudi Arabia.

Dr. Weiss holds a B.A. from the European Partnership of Business Schools, an M.B.A. from Columbia University, and a Ph.D. in Business Economics from Harvard University.