ELIZABETH A. KÓCS, PHD
UIC ENERGY INITIATIVE, DIRECTOR FOR PARTNERSHIPS & STRATEGY
NATIONAL RENEWABLE ENERGY LABORATORY (NREL), ENERGY EXECUTIVE
CENTER FOR URBAN RESILIENCE & ENVIRONMENTAL SUSTAINABILITY (CURES), CO-FOUNDER
Grid Partner
Environmental Ally
Economic Value Stacking
Consumer Need Nexus
Societal Benefit Connector
LESS THAN HALF OF U.S. ENERGY CONSUMPTION IS ELECTRIFIED

Source: Electrification Futures Study, NREL, 2018
Grid Partner – Revenue & Load Growth Planning for Utilities

**Planning for EV Load Growth**

**Infrastructure**
- **Static Rates**
- **Dynamic Rates + Rebates**
- **Connected Smart Charging**
- **Not-Connected Smart Charging**

**Price Signals**

**Smart Charging**


Residential Smart Charging Pilot in Toronto: Results of a Utility Controlled Charging Pilot, 2018, Fleetcarma.com
Align charging with time when clean energy is produced.

California’s Evening Peak
Ripe for daytime charging
Overproduction from solar

Off-Peak Times Vary
Charging at off peak
Negative rates
Overproduction

Less Peak Generation → Cleaner Grid

Environmental Ally – Cleaner Grid & More Efficiencies


A comparison of electric vehicle Level 1 and Level 2 charging efficiency, 2014.
Environmental Ally – Illinois Electricity Generation

There is a low presence and very low growth of renewables in the region.

Illinois Electricity Generation Trends
(2007 to 2018, US DOE, EIA)

It is expected for wind and solar to increase 8,000 GWh/year between now and 2021. Currently at 12,000 GWh/year and expected to hit 20,000 in 2021.

Source: The Power Bureau
Focus on areas of greatest impact that address challenges to EV adoption

Government & Utility Involvement is Needed as EV Sales Grow Exponentially by 2025

- Cities and States support acceleration
- Focus on most challenging areas that supports market development

Number of EV Regulatory Dockets in USA

Dockets identified through AEE PowerSuite (https://powersuite.aee.net) search of relevant EV dockets for 2019.
Economic Value Stacking – Embedded Future Workforce Development

Estimated number of chargers,\(^1\) million

- United States: 11
- China: 19
- European Union: 17

Estimated capital investment, $ billion

- United States: 11

Total energy demand, billion kilowatt-hours

- China: 271
- European Union: 92
- United States: 23

Notes:
- Annual mileage per private electric vehicle estimated at 18,095 km for US, 14,989 km for EU, and 11,000 km for China with no growth estimated for future years.
- Battery efficiency considered to be ~20 kilowatt-hours per 100 km.
Consumer Need Nexus – Aligning with Human Behavior

EV Charging Network is Critical for:
• Overcoming range anxiety
• Aligning with consumer behaviors
• Addressing “refuel time” limitations

Typical Time to Fill an 80 Mile Battery by Charging Type

- Level 1: overnight, 16 hours
- Level 2: longer stops, 3.5 hours
- DC Fast: on the go, 30 minutes*

Square miles per charging station:
- 0.7-40.5
- 61-147
- 169-491
- 581-1,423
- 1,676-95,107

Least: Alaska

Most: D.C.

ChargePoint, Quick Guide to Fast Charging, 2018
Consumers
• 90% as cash savings in vehicle operating costs
• 0.1% in reduction in annual electricity bills
Society
• 10% in the form of climate change mitigation due to reduced GHG emissions
THANK YOU

ELIZABETH A. KÓCS, PHD
UIC ENERGY INITIATIVE, DIRECTOR FOR PARTNERSHIPS & STRATEGY
NATIONAL RENEWABLE ENERGY LABORATORY (NREL), ENERGY EXECUTIVE
CENTER FOR URBAN RESILIENCE & ENVIRONMENTAL SUSTAINABILITY (CURES), CO-FOUNDER
Email: ekocs@uic.edu  Cell: 708.267.4097