

# NextGen Highways

AIEQ - Montreal Energy Conference

March 10th, 2021

NGI Consulting  
Morgan Putnam, Ph.D.

# NGI Consulting

- NGI Consulting was founded by Morgan Putnam to help cities, corporations, and states envision a path towards next-generation infrastructure.

## Morgan Putnam, Ph.D.

- Created and led the [MN Solar Pathways](#) project. The project received national attention (e.g., [The Interchange](#), [Utility Dive](#), and [CleanTechnica](#)) for highlighting the value of overbuilding renewable capacity to address resource adequacy requirements during periods of low solar and low wind production.
- Developed the vision and partnerships needed to improve utility interconnection processes for distributed energy resources (see [white paper](#).)

# Fact 1: A Stronger Transmission Grid is Needed

- ▶ The economic and environmental benefits of a stronger transmission grid are becoming widely recognized
- ▶ As a result, there is buy-in for new transmission and for re-framing the way we view transmission investments

## Modernizing the Nation's Transmission Infrastructure

New WIRES Group Report: \$230  
- \$690 Billion Investment In US  
Transmission System Needed By  
2050 To Support A More  
Electrified Economy



## Fact 2: Transportation Electrification is Coming

engadget

The future of Daimler trucking is electrified and autonomous



\*Genentech is also a member of the Corporate Electric Vehicle Alliance.

TECH / TRANSPORTATION / CARS

Amazon will order 100,000 electric delivery vans from EV startup Rivian, Jeff Bezos says

**THE VERGE**



## Fact 3: Clean Vehicles Need a Strong Grid



### City grids risk being overwhelmed by EV growth

- Cities' increased reliance on electric vehicles (EVs) and electric buses could overwhelm their electric grids and result in outages, warned a new report from the Rocky Mountain Institute (RMI) and Seattle City Light.



### Daimler and PGE creating Electric Island for truck charging

> 1 MW per vehicle!!!

### WEST COAST CLEAN TRANSIT CORRIDOR INITIATIVE STUDY

Grid capacity does not exist along key transit corridors to serve heavy-duty charging needs



## Considering These Facts...

### *New Transmission should be Co-Located with State and Federal Highways*

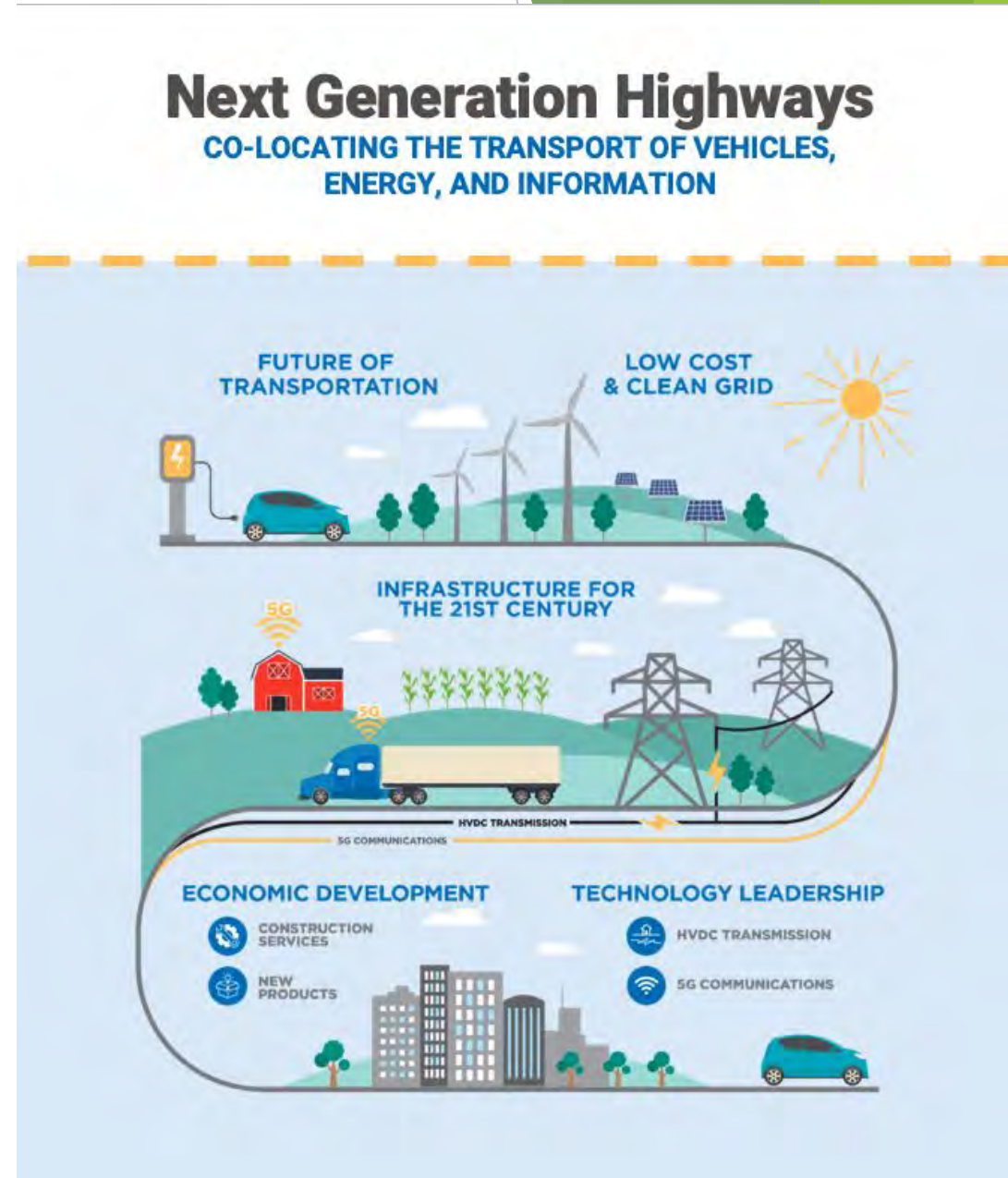
- ▶ Takes advantage of an existing right-of-way
- ▶ Ensures that significant power will be available to support transportation electrification
- ▶ Buy-in is possible from many stakeholders for many reasons: economic, health, and social justice, etc.

# NextGen Highways

NextGen Highways are highways with the strategic co-location of:

- ▶ electric transmission lines
- ▶ ZEV charging/fueling infrastructure
- ▶ fiber, 5G, and other communications infrastructure

[as discussed in this white paper](#)

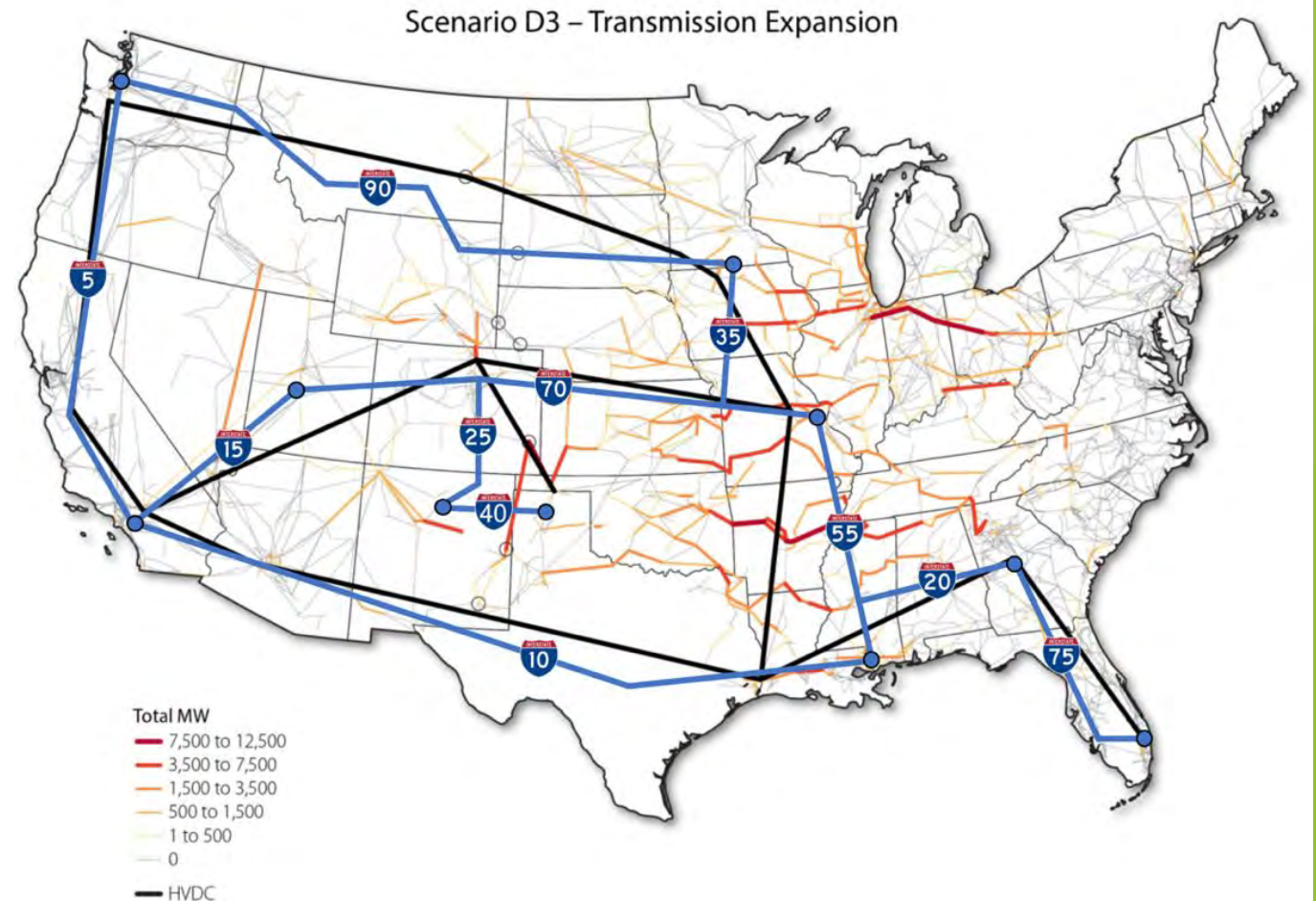


# NextGen Highways Would Enable a National HVDC Transmission Grid

The black lines in the figure represent an HVDC grid that could deliver \$1-2 of net benefits for every \$1 invested and enable 85% renewable penetration.

The dark blue lines represent the parts of the existing federal highway system that could be used for the construction of a nearly equivalent HVDC grid.

As can be seen, there is a strong overlap between the two.



A. Figueroa Acevedo, et. al., “Design and Valuation of High-Capacity HVDC Macrogrid Transmission for the Continental US,” IEEE Transactions on Power Systems, IEEE Xplore Early Access. DOI 10.1109/TPWRS.2020.2970865, 2020.



# Case Study: I-405 in Washington State

Transportation electrification inherently links transportation and grid infrastructure.

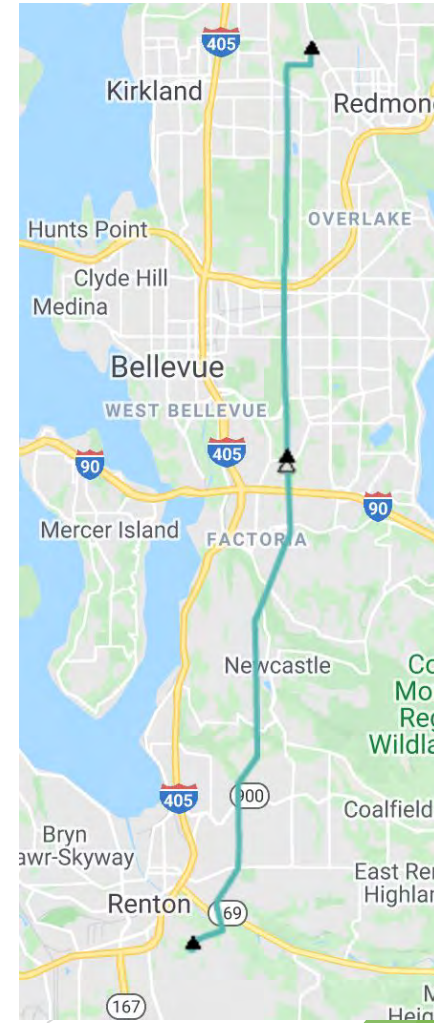
WA State is making 50-year infrastructure investments in transportation and grid infrastructure that don't consider that linkage.

The I-405 Master Plan was created from an EIS created in 2002. Electric vehicles were not considered in that EIS.

I-405 Project  
(Transportation)



Energize Eastside  
(Transmission)



# Organizations Interested in Further Exploration of the NextGen Highways Concept



**GREAT PLAINS  
INSTITUTE**

Better Energy.  
Better World.



Americans for a  
Clean Energy Grid



NORTH AMERICAN COUNCIL FOR FREIGHT EFFICIENCY



**CLEAN GRID  
ALLIANCE**  
Delivering Midwest Renewable Energy



**CONSERVATION  
MINNESOTA**



# Recent Support for Elements of NextGen Highways

*“[for heavy-duty EV fleets], switching to a medium/high-voltage, DC-based system could be less costly than adding a traditional solution,”*



## REIMAGINING THE GRID

December 2020



## A transportation, infrastructure and climate priority

*“I think it’s important for us to think about digging once and also potentially using those rights-of-way if we have to ground grid transmission wires or if we would like to get broadband to rural communities.”*



# Questions?

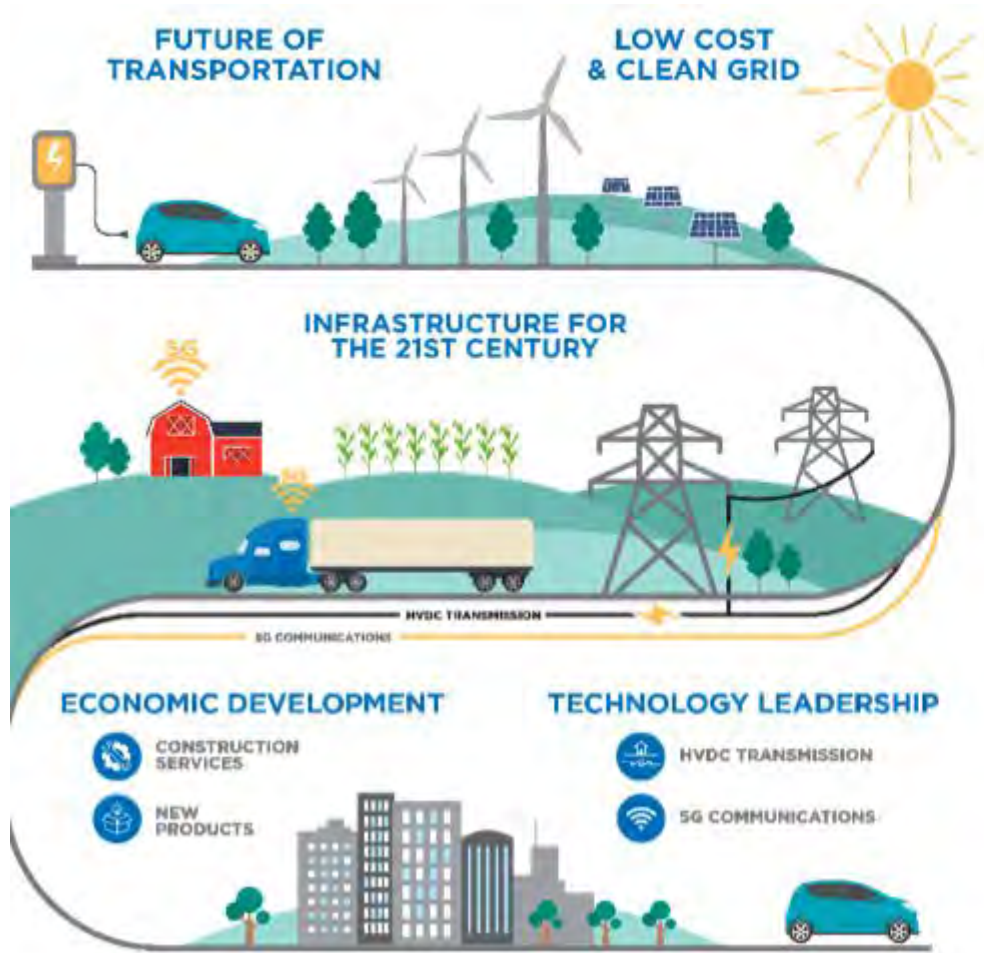
NGI Consulting

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# Benefits from NextGen Highways



## UTILITIES / RENEWABLES

enable new transmission needed to support transition to renewable energy

## DOTs / EVs

support transportation electrification

## COMMUNITIES / EQUITY

improve air quality, reduce noise pollution

## ECONOMY / JOBS

create hundreds of thousands of new jobs

# NextGen Highways are a Transportation Electrification Platform

There are many ways to power an electric drivetrain...

Fast Charging Stations



Hydrogen Stations



even Wireless Charging Lanes



... but they all require a strong grid.

**Q1: Which should we build first, 500,000 charging stations or a strong grid?**

# Barriers to NextGen Highways

Historical barriers to co-location include:

- *Safety*: potential for vehicle collisions with the towers
- *Expansion*: preservation of the right of way for future expansion
- *State policies*: utility accommodation plans that prohibit/discourage co-location

*Q2: What barriers should be added to this list?*

# Overcoming the Barriers to NextGen Highways

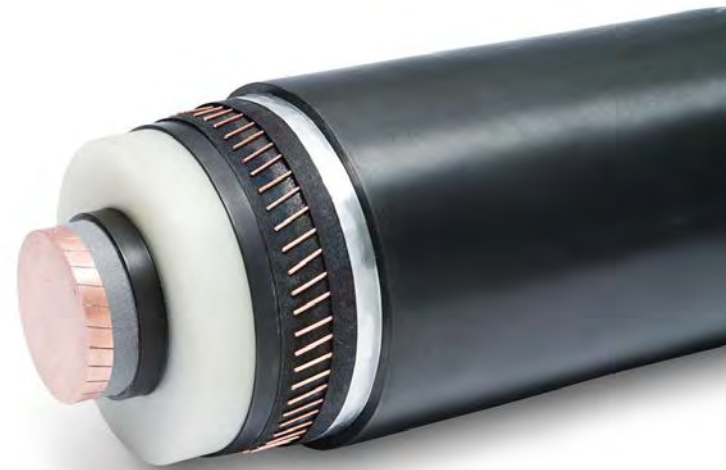
1. Update DOT utility accommodation manuals & processes
2. Increase coordination between DOTs and utilities
3. And go underground with direct current transmission



## German Transmission Grid Operators Award Contracts for SuedLink Corridor

The Corridor is the largest ever underground cable project.

JUN 29, 2020





## Suggested Actions for States, DOTs, and Utilities

- 1) Recognize cross-sector coordination between the electric utility, transportation, and communications sectors as essential to the clean energy transition.
- 2) Update state Utility Accommodation Plans (and processes) to increase ease of access to the interstate right-of-way.
- 3) Initiate a multi-stakeholder process to examine the potential for NextGen Highways to expedite transmission development and transportation electrification

# State Support for Co-Location

## **2003 WISCONSIN ACT 89**

system, and protection of the environment, the following corridors should be utilized in the following order of priority:

- (a) Existing utility corridors.
- (b) Highway and railroad corridors.
- (c) Recreational trails, to the extent that the facilities may be constructed below ground and that the facilities do not significantly impact environmentally sensitive areas.
- (d) New corridors.

# Two Key Comments from CapX2050 Transmission Vision Report

**“Separate study processes that exist today for interconnection planning, economic planning, operational planning and annual reliability assessments may need to be combined into a more comprehensive study to increase certainty that future transmission plans are able to provide multiple benefits.”**

**Future planning efforts will need to be integrated across generation, transmission, and distribution...”**

**Just like the electric sector needs to integrate its planning process to provide multiple benefits, we need to integrate our planning processes across the energy, transportation and communication sectors.**

# NextGen Highways are a Communications Platform

AV  
Infrastructure

**How China's new highway for self-driving cars will boost its AV ambitions**

by IVAN MEHTA — 9 months ago in CARS



5G  
Infrastructure

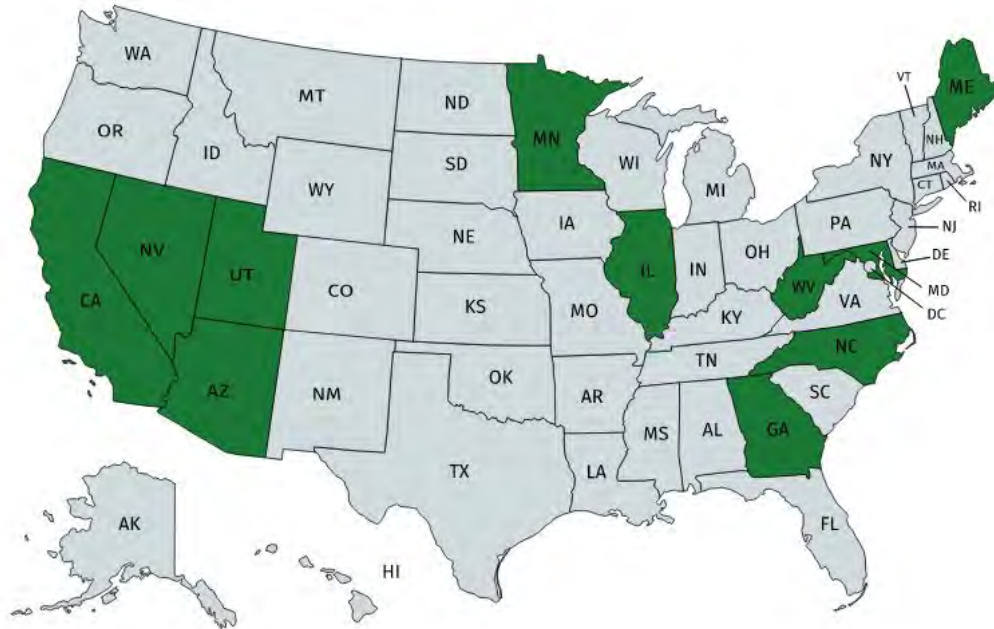
Broadband  
Infrastructure





# Federal Dig-Once Legislation

- ▶ Would require conduit for new fiber to be placed in highway ROW during federally funded construction projects
- ▶ Is a bi-partisan cost-reduction policy that has been passed by eleven states (who are as diverse as CA & WV)

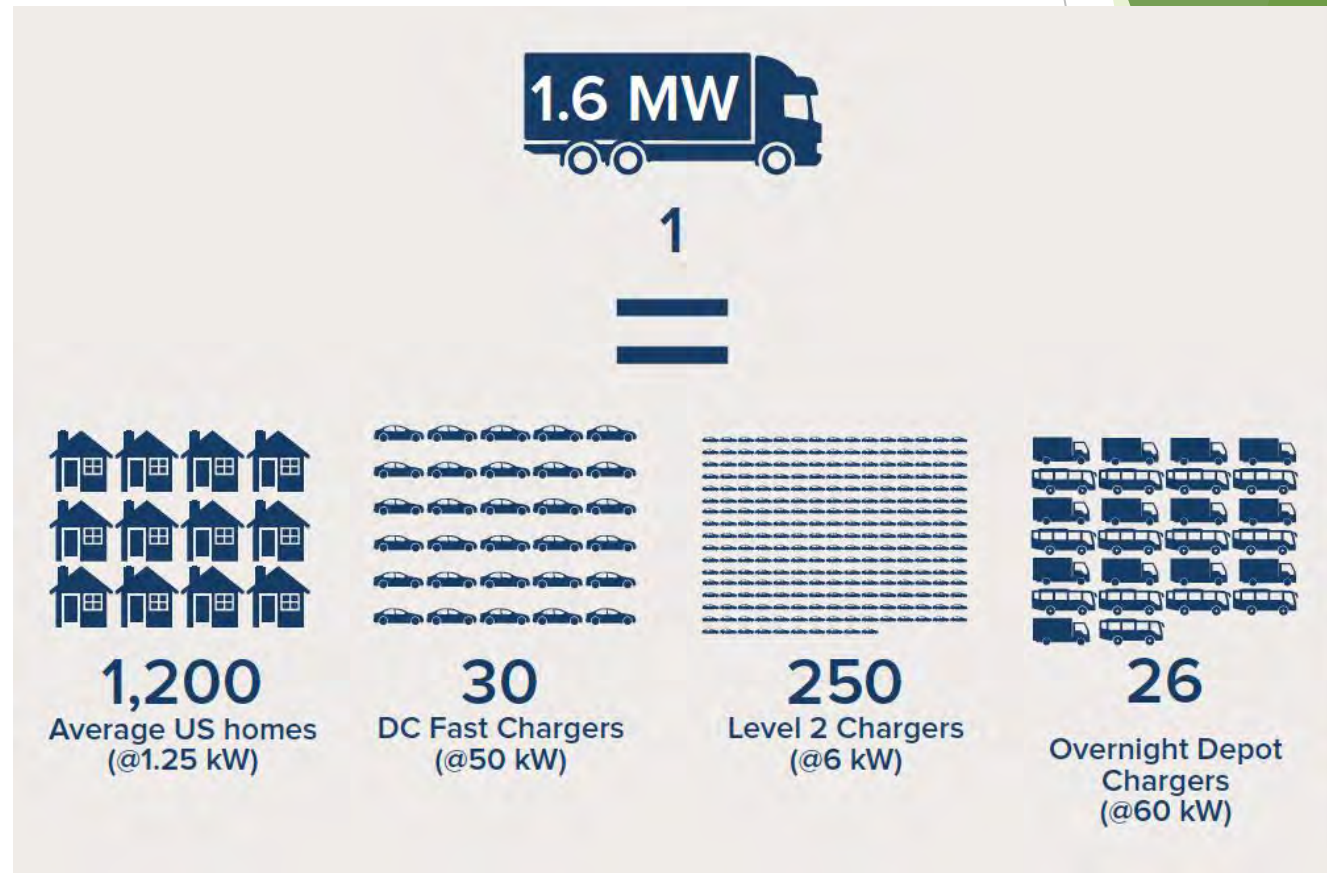


← States who have passed Dig Once legislation

# NextGen Highways Will Enable Medium/Heavy-Duty Vehicle Charging

Heavy-duty trucks have fundamentally different charging requirements.

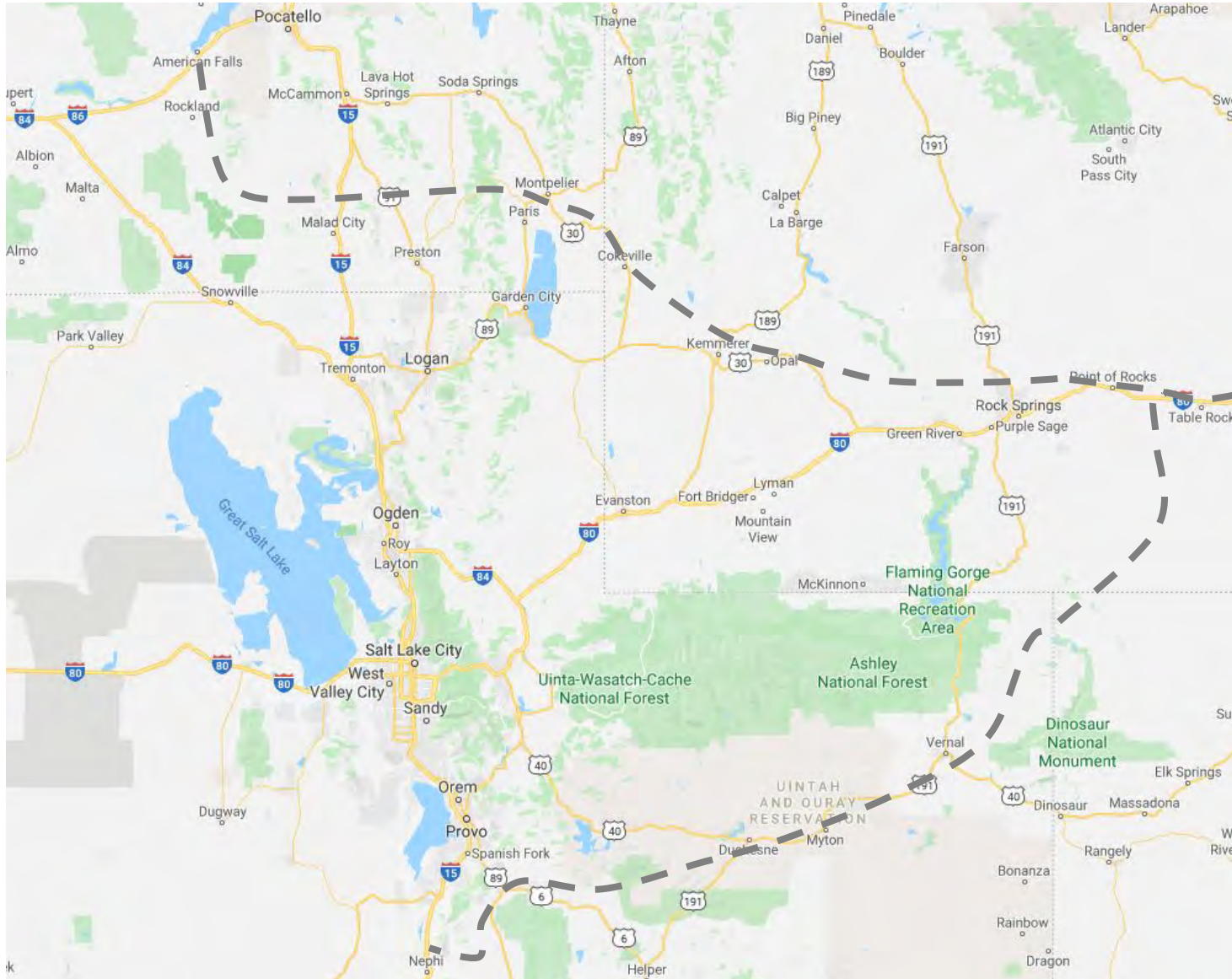
And fleets of medium and heavy-duty trucks will require extensive grid upgrades, including new substations and transmission infrastructure.



<https://rmi.org/insight/seattle-city-light/>

\*Infographic taken from Rocky Mountain Institute's transportation electrification study for Seattle City Light.

# Case-Study: Energy Gateway Transmission Project



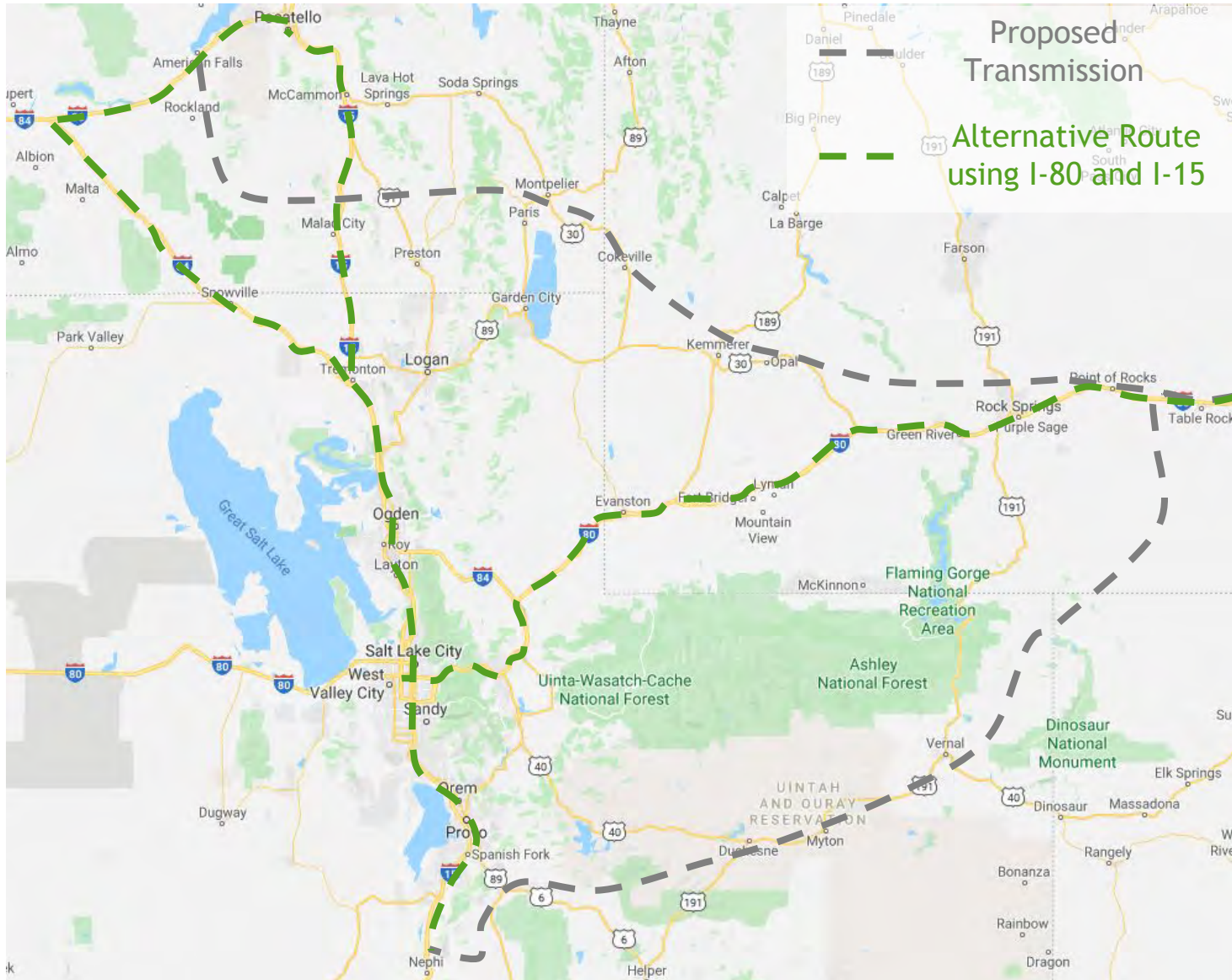
Planning started in early 2000's

Understandably did not consider vehicle electrification

Proposed lines are far from major highways (I-80, I-84, and I-15)



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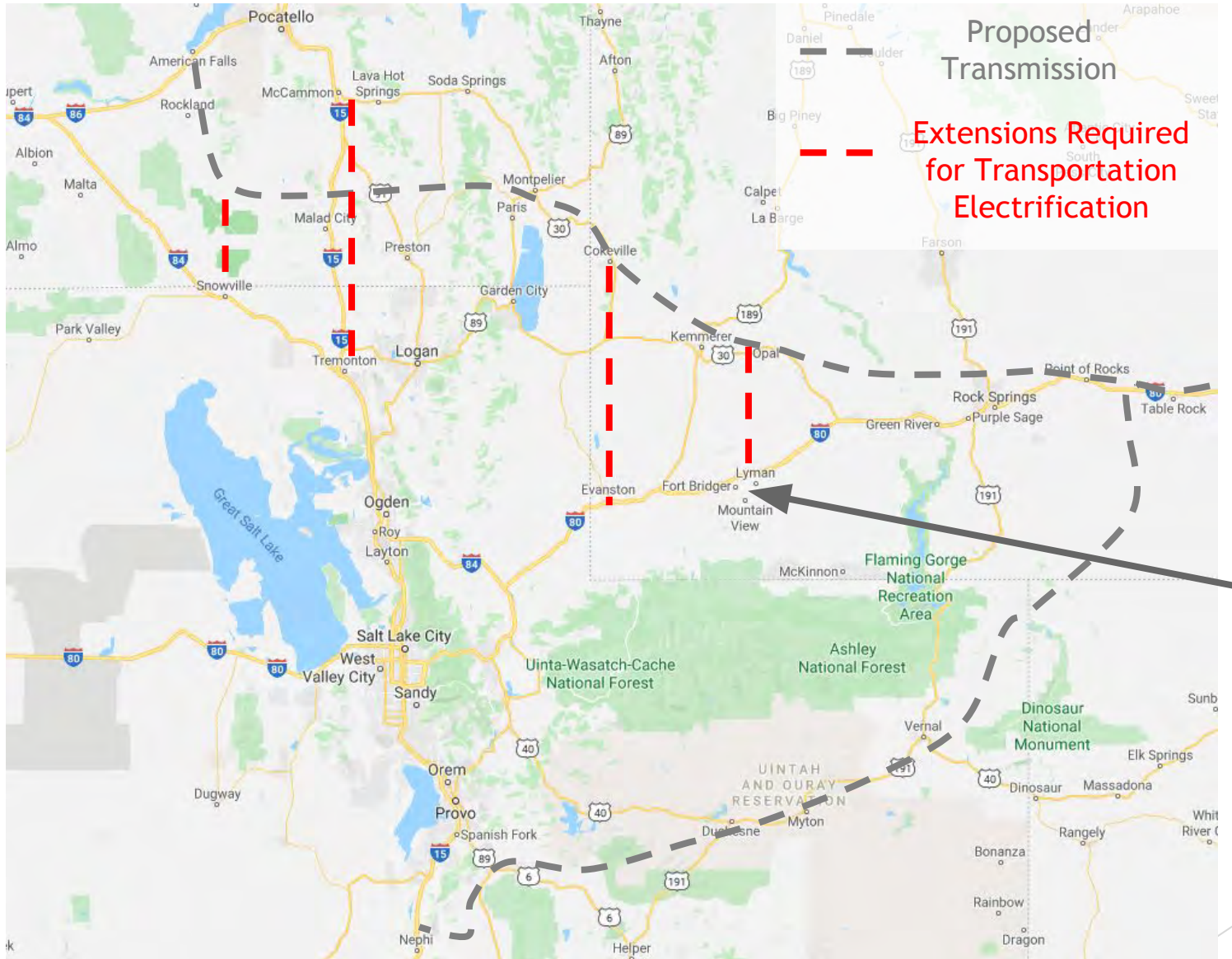
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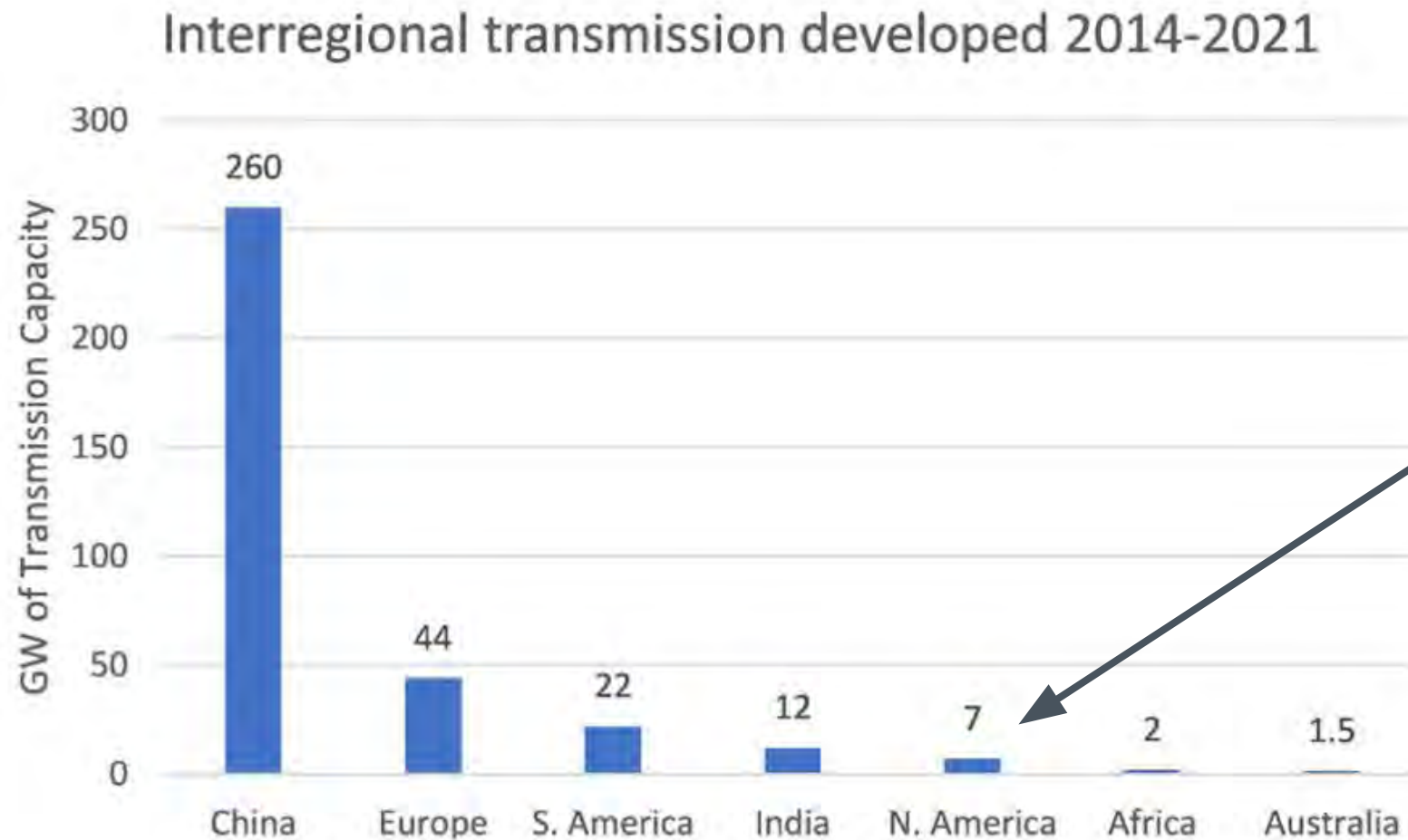
An alternative route using I-80 and I-15 would prepare for an electrified transportation future



# Case-Study: Energy Gateway Transmission Project



# The US is Worst than Last! We are DNF.

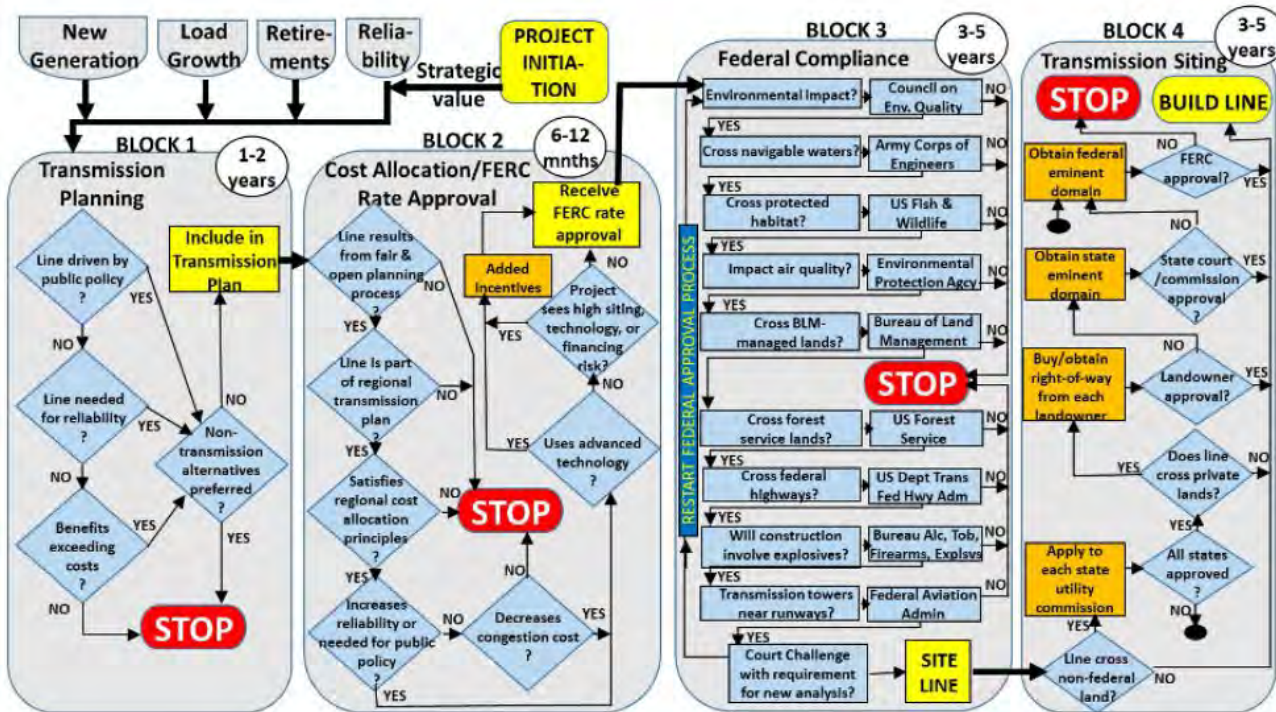


3 GW of not yet fully permitted transmission is attributed to the US



# Transmission Development Today

It's Complicated



To put it in  
Layman's Terms:

*Community Chest*

**GO TO JAIL**

Go Directly to Jail

DO NOT PASS GO

DO NOT COLLECT \$200



1935 PARKER BROTHERS INC.