Western Transmission Expansion Coalition "WestTEC"

March 17, 2026

ESIG Spring Technical Workshop

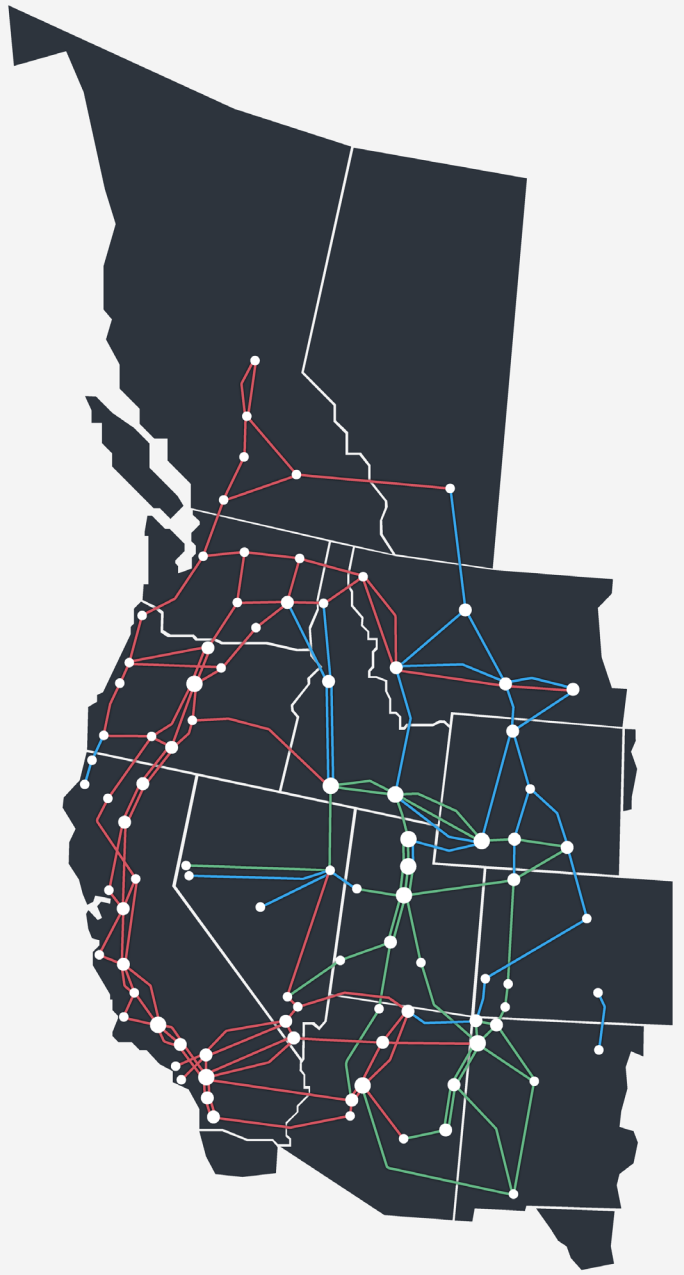
Session 2B: Expanding the Grid in the Western U.S.: Planning, Coordination, and Delivery

Western Transmission Expansion Coalition – "WestTEC"

» *West-wide 10 and 20-year transmission study*

» *Industry-led with unprecedented regional partner inclusion*

» *Goal is to produce an actionable transmission study*



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RED / 500 kV

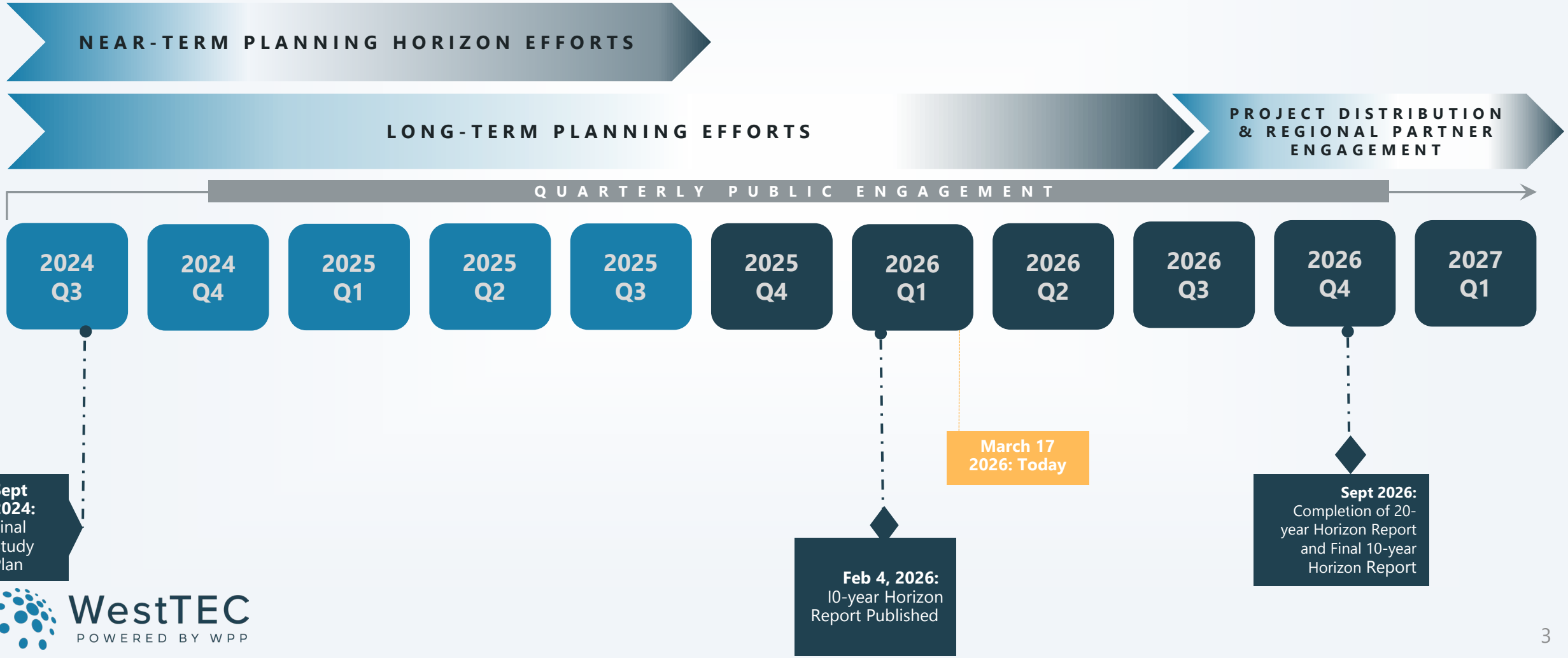
GREEN / 345 kV

BLUE / 230 kV

*Schematics are approximate & used for illustrative purposes only.

*Updated Montana and Nevada on August 07, 2024

WestTEC Project Timeline & Future



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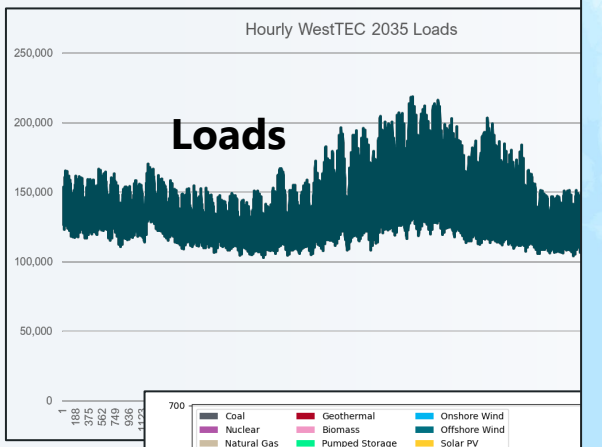
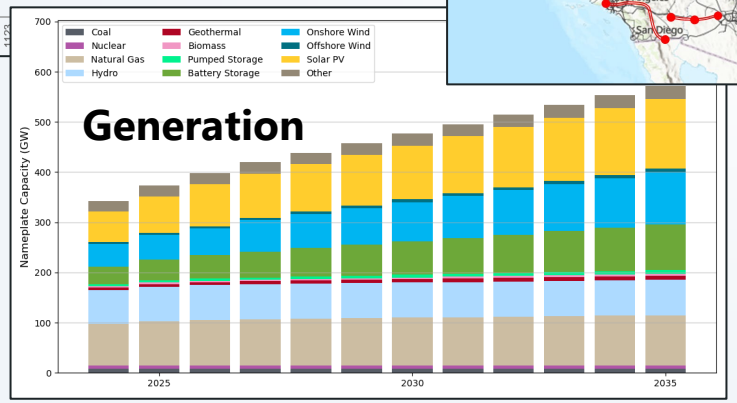
10-Year Horizon: Final Report & Key Findings

WestTEC 10-year Horizon Study Framework

Regionally consistent forecasts of….





1. System Reliability Assessment
2. Interarea Deliverability Assessment
3. Congestion Assessment

Performed serially with bespoke methods on consistent database

WestTEC 2035 transmission portfolio

Initial portfolio subject to revision based on 20-year results in 2026

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10-year Horizon: Study Purpose and Transmission Drivers

- **Why we are doing this?**
  - Need for a credible, holistic, and integrated evaluation of Western transmission needs
  - Focus on identifying critical interregional transmission gaps and actionable projects
  - Prepare starting point for 20-year horizon with tailored models and methods

- **Drivers of transmission challenges we see over the approaching 10-years:**
  - **Unprecedented load growth.** West-wide peak demand increase of approximately 30% (3x of prior decade).
  - **Resource additions.** Forecasted at 20 GW per year, doubling historical rate.
  - **High interregional power transfers** during critical peaks, cold snaps, etc.

Metric	2024	WestTEC 2035 Reference Case	Change (%)
Coincident Peak Demand (GW)	168	219	**+30% (2.4% per year)**
Annual Energy (TWh)	926	1,246	**+35% (2.7% per year)**
Generation Capacity (GW)	322	551	**+71% (5.0% per year)**
Transmission 230kV+ (Miles)	~98,000	~111,400	**+14% (1.2% per year)**

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🚨 **Transmission is not keeping pace**

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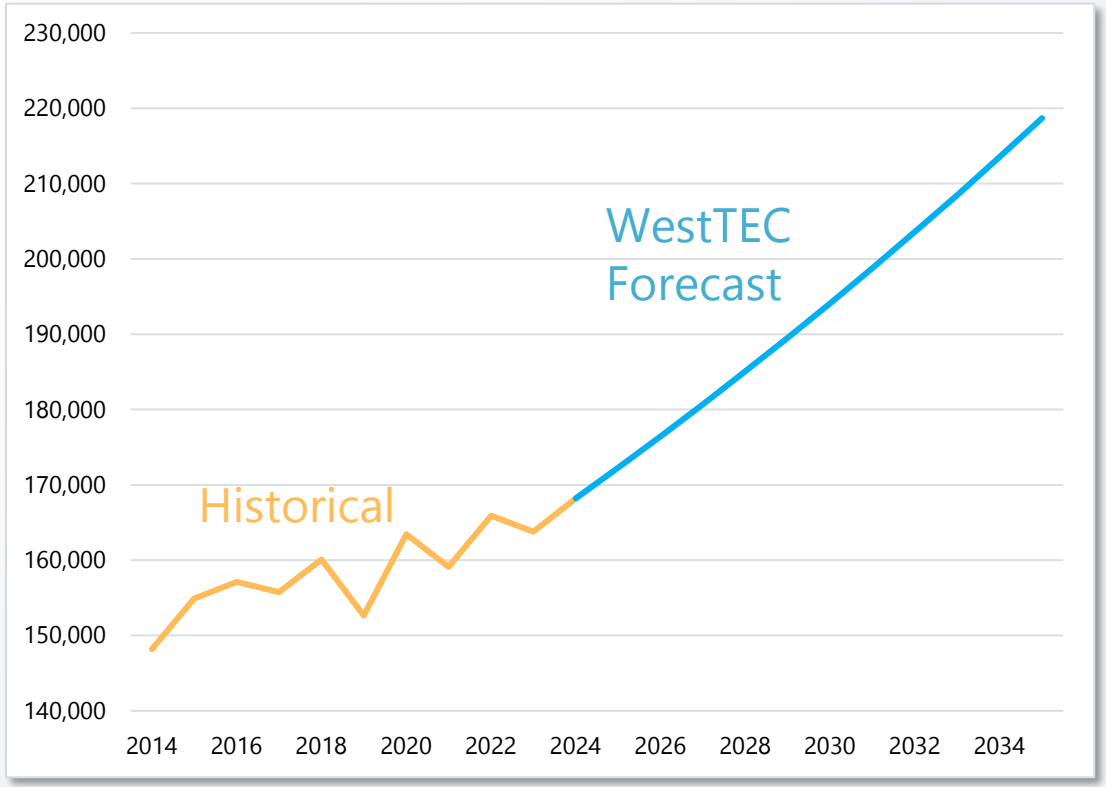
Critical Input: Load Trajectory

Load Forecast Developed Through Regional Collaboration

- Load projections were sourced primarily from the **WECC 2034 Anchor Data Set (ADS)** with refinement based on benchmarking with NREL's scenarios, review at WATT, and data updates from utility participants
- Accounts for forecasted electrification of buildings/transportation, conservative levels of growth in industrial and **data center loads (+9 GW)**, and impacts of demand-side resources
- WestTEC forecasts peak demand to grow at roughly **2.4% annually over the approaching 10-years**, which is more than double this growth rate over the prior 10-years

Growth in Western Interconnetion Annual Peak Demand (MW)



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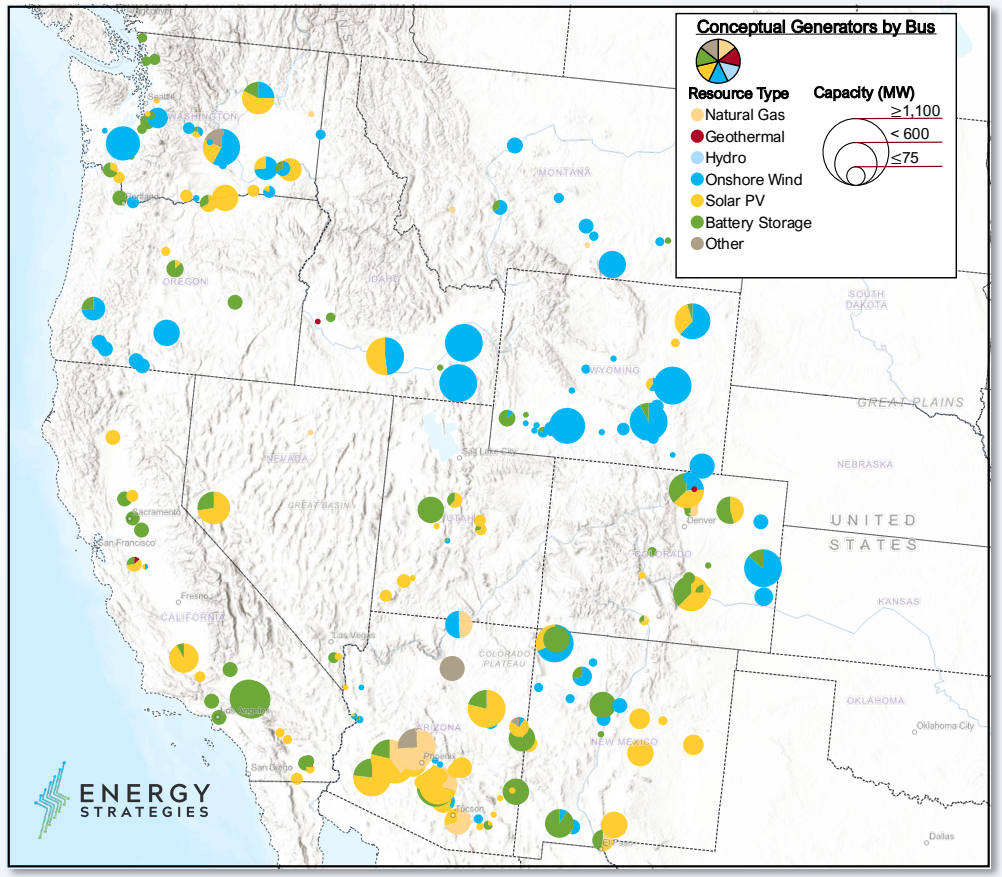
Critical Input: Resource Mix and Busbar Mapping

WestTEC 2035 Reference Case Resource Mix (GW)

Resource Type	2024	2035 WestTEC Reference Case
Natural Gas	109	97
Hydro	75	70
Solar PV	44	115
Wind	39	87
Coal	22	9
Battery Storage	16	70
Nuclear	7	6
Other	5	35
Geothermal	4	7
Total	322	495

The “Other” category includes pumped storage, solar thermal, biomass, and alternative-fuel thermal generators.

Siting Conceptual Resource Additions



WestTEC developed a busbar mapping framework to allocate roughly 87 GW of un-sited conceptual resources from utility IRPs to substations across the region

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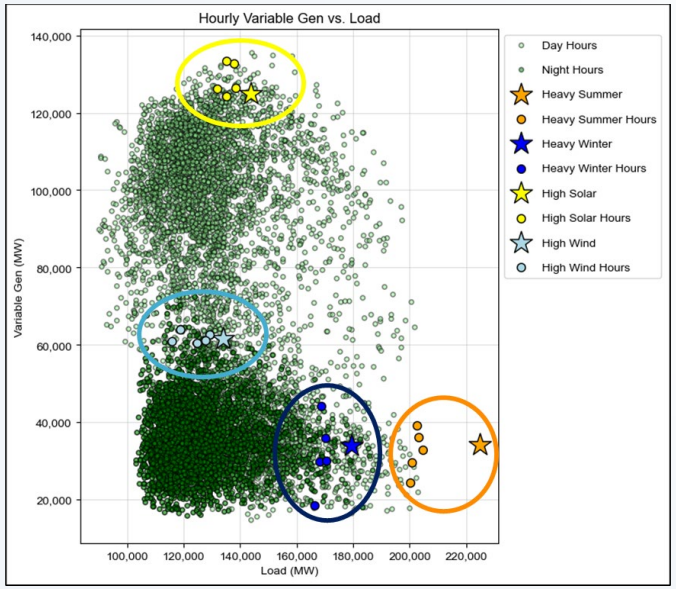
Critical Input: Study Methods

System Reliability Assessment

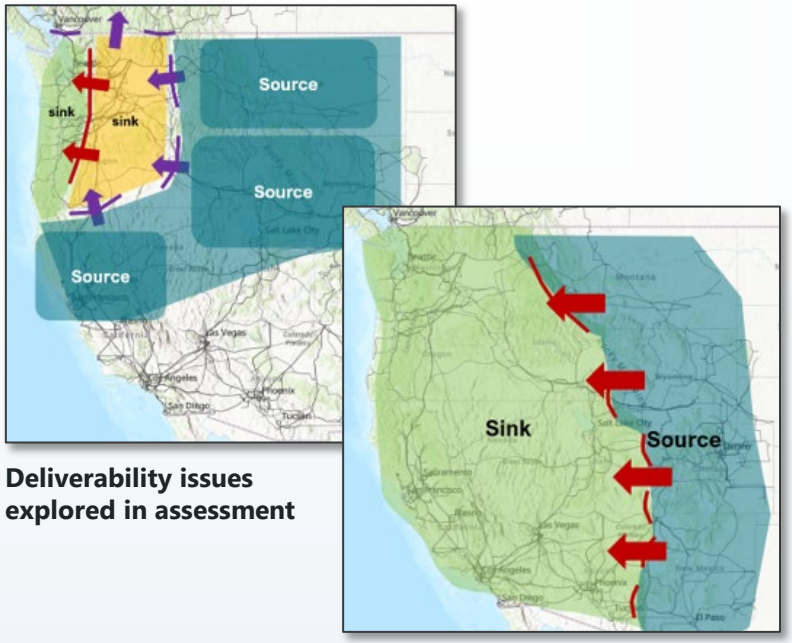
Evaluating reliability under stressed yet credible future conditions that will challenge the grid.



Four reliability snapshots capture range of conditions

Interarea Deliverability Assessment

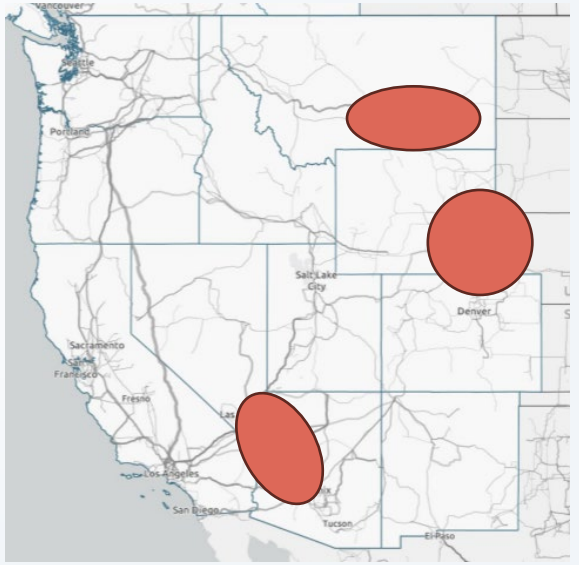
Examines if resources can be reliably transferred when the load and generation diversity of the West must be realized to maintain adequate supply.



Deliverability issues explored in assessment

Congestion/economic Assessment

Identify economic inefficiencies due to remaining transmission constraints.



Congestion hot spots identified in study

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Stakeholder Impact: Key Areas for 10-year Horizon Study

- Development of Study Plan and refinement of assessment methods
- Siting of future generation resources
- Identification and evaluation of solutions in response to transmission needs
- Interpretation of results and study findings

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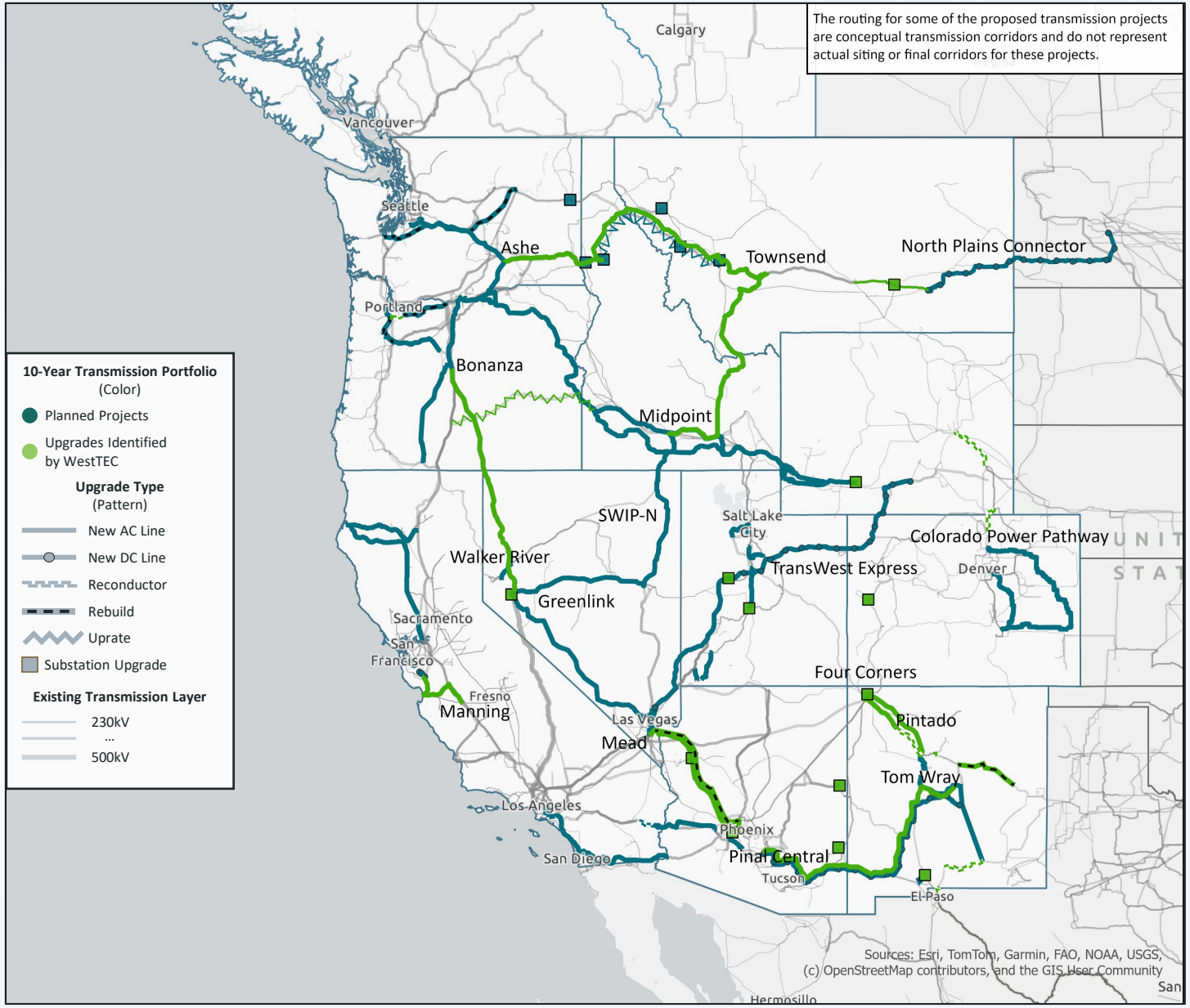
10-year Horizon Transmission Portfolio and Key Findings

10-Year Horizon Portfolio:

All Upgrades



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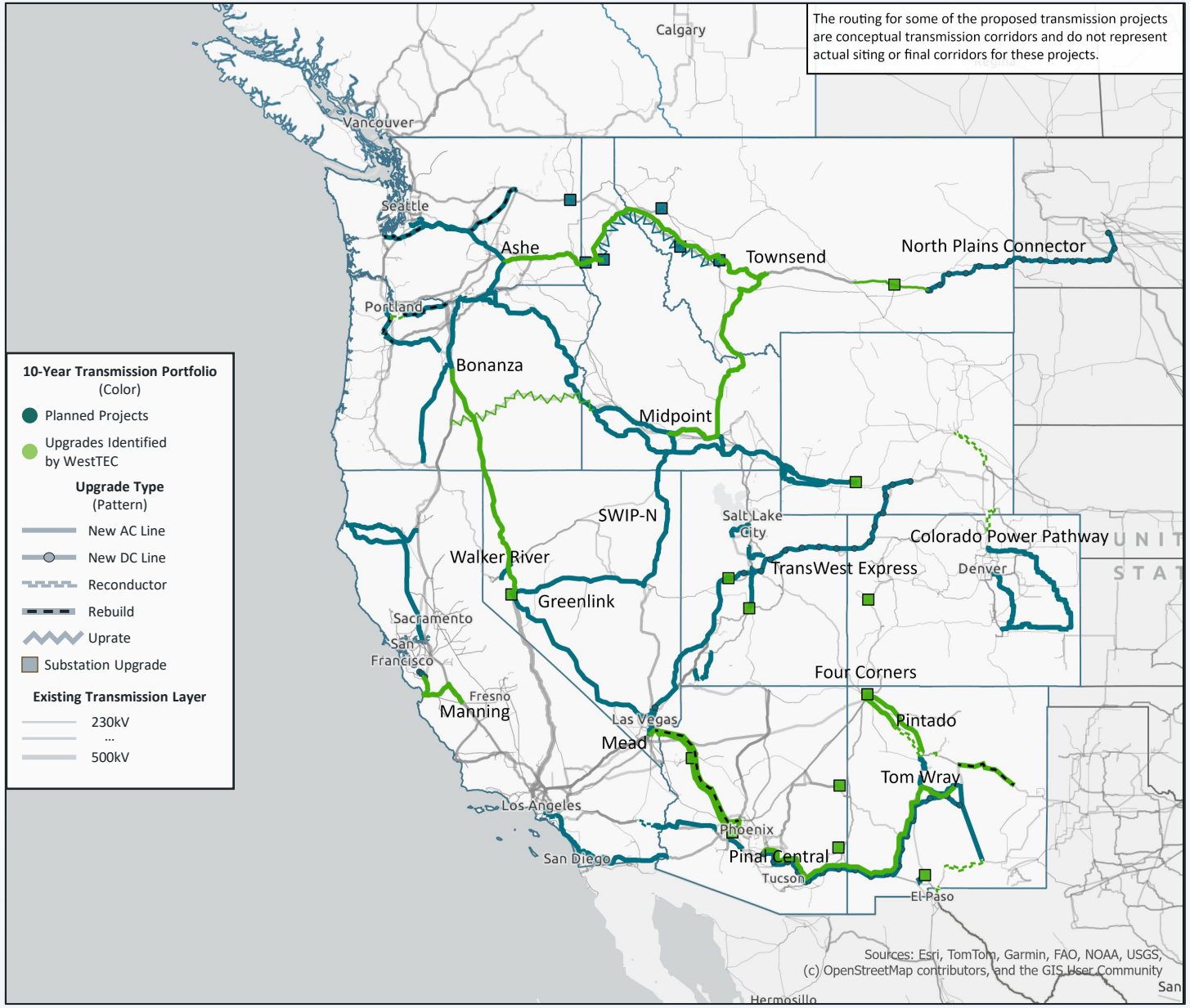
10-Year Horizon Portfolio:

All Upgrades

Finding #1:
The 10-year portfolio positions the West to meet growing demand, integrate new resources, and strengthen reliability

Trying to meet utility projections for load growth and resource procurement without interregional transmission investment on this scale would likely have *significant reliability and resilience implications for the West.*



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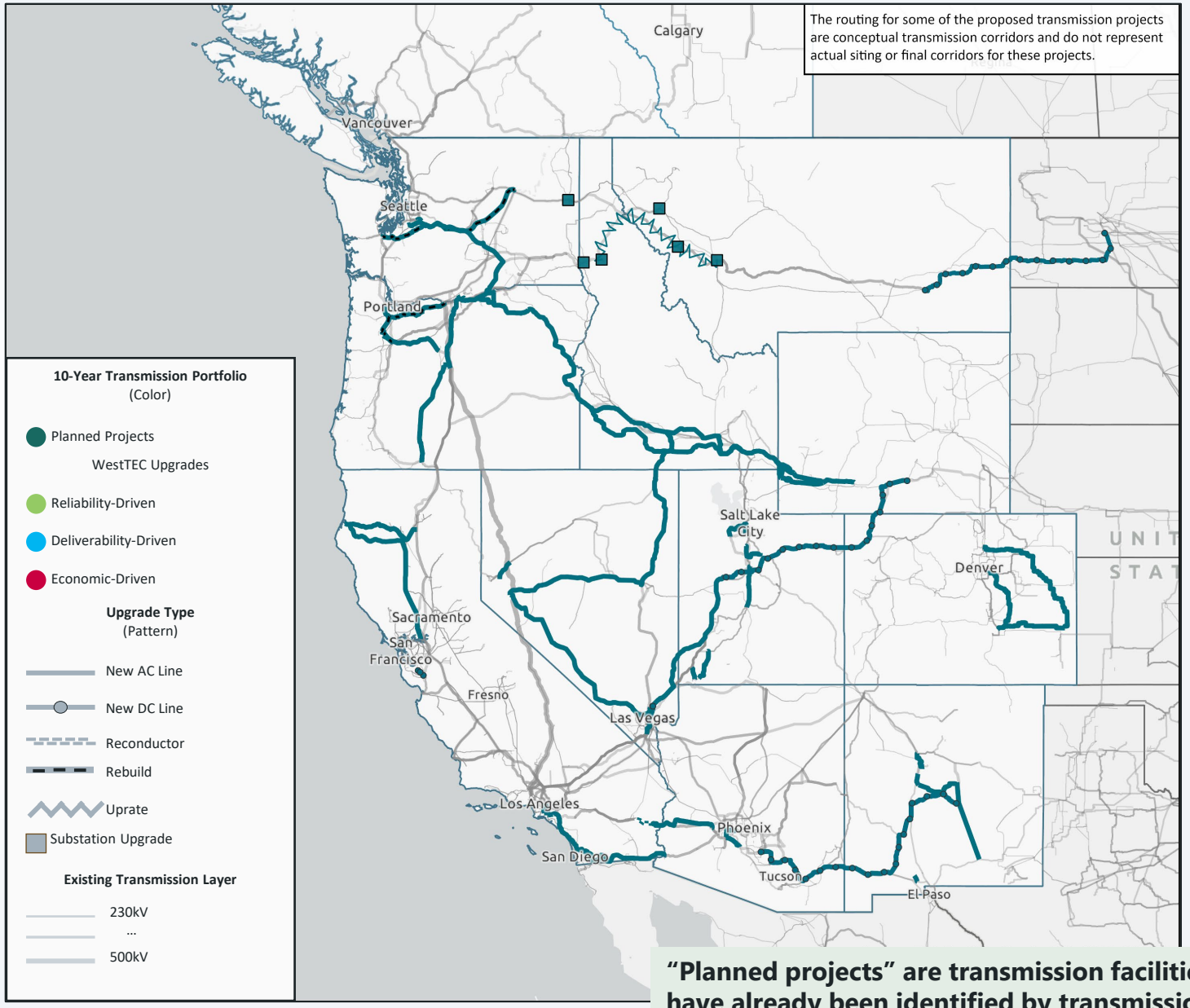
10-Year Horizon Portfolio:

Planned Projects Only

Finding #2:
Timely completion of planned projects is essential

The coordinated and cost-effective delivery of these 9,358 miles of planned transmission should be prioritized by utilities, developers, regulators, and regional stakeholders.



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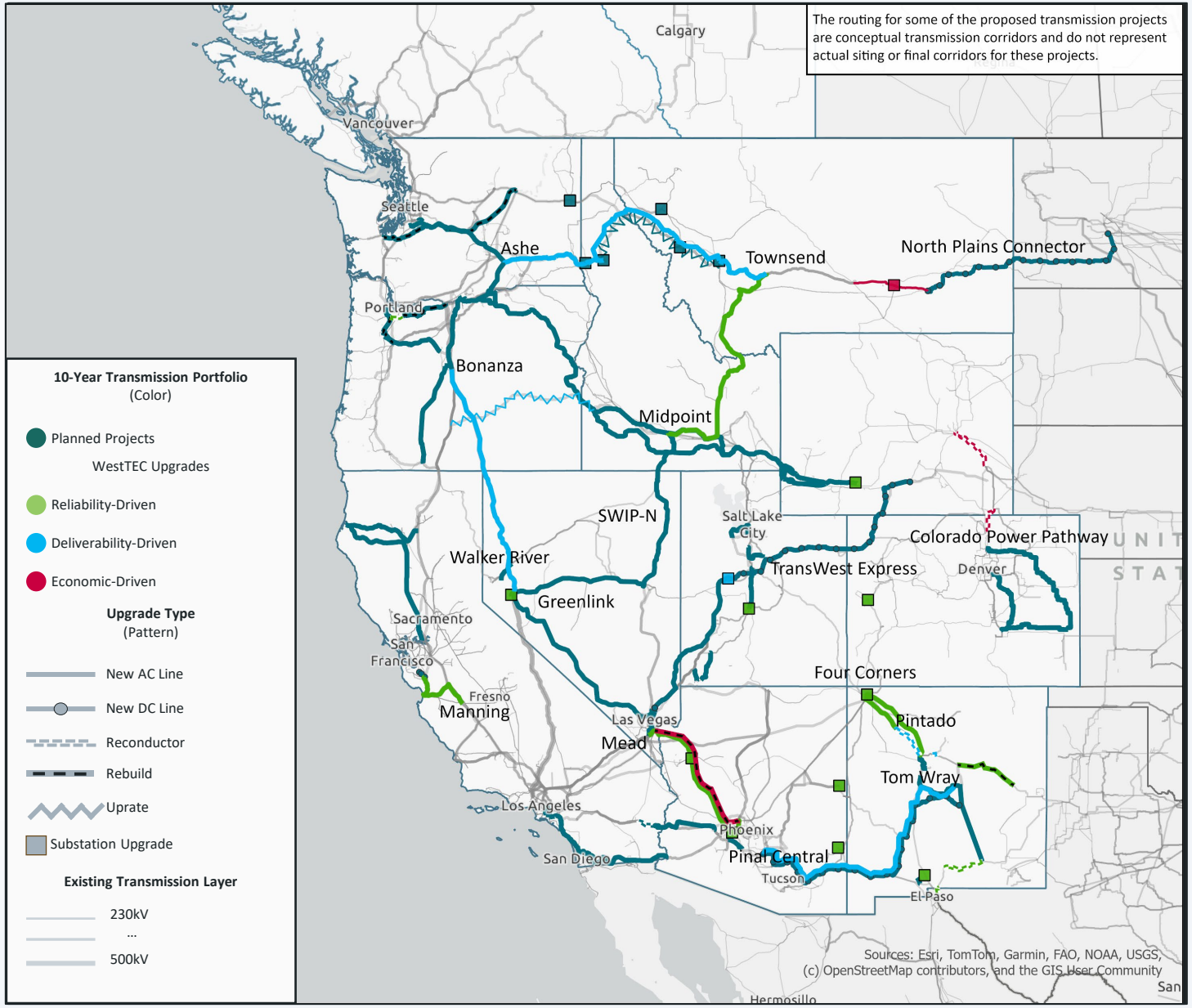
"Planned projects" are transmission facilities that have already been identified by transmission owners, developers, or regional planning bodies and that exhibit a credible path to implementation

10-Year Horizon Portfolio:

WestTEC-identified Upgrades Added

Finding #3:
Conceptual projects require sponsorship and support

Several high-value projects identified in this study are unsponsored or are at conceptual planning states. These conceptual or unsponsored upgrades address critical interregional needs and require active development on an ambitious timeline.



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10-year Horizon Portfolio Summaries and Cost Estimates

- The 10-Year Horizon portfolio includes over 12,600 miles of regionally-significant upgrades or additions with a total cost of ~$60 billion
- About two-thirds of these line miles meet the criteria of planned projects according to the WestTEC study plan
  - Nearly 20% of these are under-construction or are nearing construction
- The remaining one-third of line miles represent upgrades identified as part of WestTEC transmission solutioning efforts

Transmission Project Category		Project Count	Total Line Miles	Total Estimated Cost ($M)
Planned upgrades in Portfolio		73	9,358	$46,648
Upgrades identified by WestTEC in Portfolio	Reliability-driven	21	1,156	$6,050
	Deliverability-driven	8	1,742	$7,239
	Economic-driven	3	394	$391
10-Year Horizon Portfolio Total		**105**	**12,650**	**$60,328**

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10-year Horizon Portfolio Summaries and Cost Estimates

- Significant portion of the 12,600 line miles upgraded in the portfolio is from development of **planned greenfield lines**
  - This finding speaks to the importance on delivering on these lines, many of which may still have significant development milestones ahead of them
- However, rebuilds of existing lines and reconductoring projects (including advanced conductors) play a key role and help expand grid efficiency at a lower cost per mile

Upgrade Type	Count	Total Line Miles	Total Estimated Cost ($M)
10-Year Planned	**73**	**9,358**	**$46,648**
New Line	53	8,457	$42,125
Rebuild	11	553	$2,741
Reconductor	7	348	$687
Substation	2	-	$550
Uprate	1	90	$545
Congestion	**3**	**394**	**$391**
Reconductor	3	394	$324
Series Capacitor	2	-	$67
IDA	**8**	**1,742**	**$7,239**
New Line	3	1,425	$7,052
New Transformer	1	-	$41
Reconductor	3	75	$92
Uprate	1	242	$55
SRA	**21**	**1,156**	**$6,050**
New Line	7	947	$4,834
New Shunt	2	-	$26
New Transformer	8	0	$171
Rebuild	1	110	$940
Reconductor	3	98	$79
Grand Total	**105**	**12,650**	**$60,328**

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Cost Context: How to think about affordability and this portfolio

- WestTEC hopes properly frame the cost of the 10-year Horizon Transmission portfolio
  - Transmission is front-loaded capital that is repaid over decades, which allows benefits to be realized over time
- Using typical financing assumptions, the portfolio is estimated to cost roughly $5.3 billion per year
  - This is quite small as compared to total Western electricity spending, which was nearly $120B in 2024
- **Finding #4**: The 10-year portfolio cost is substantial but financially proportionate and feasible — comparable to other large public works and justified by the durable reliability and resource value it unlocks.

WestTEC 10-year Horizon Transmission Portfolio Cost Metrics	Cost Benchmarks	WestTEC Transmission Cost vs Benchmark
Capital cost = $60 billion	• Comparable to other megaprojects, such as California's high-speed rail system (~$100B) and three Portland-area bridge replacements (~$12B)	• ~60% of California high-speed rail cost • ~5x the Portland bridge program cost
Levelized cost = $5.3 billion per year	• Western U.S. customers spend roughly $117 billion annually • GDP of Western states exceeds $7.4 trillion. • The annualized fixed cost of new generation deployment in the WestTEC 2035 Reference Case is ~$44 billion per year	• ~4.5% of today's annual electricity spending • 0.1% of regional GDP • 17% of the annualized fixed cost of new generation
Cost per kWh of electric demand in 2035 = $0.004/kWh	• The load-weighted average retail price in the West is ~$0.16/kWh.	• ~2.5% of today's average retail electricity price

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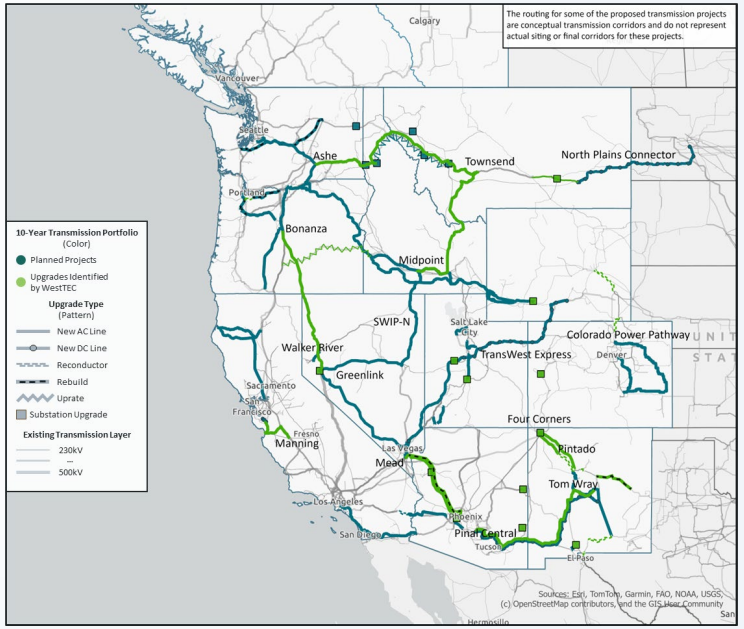
What does the transmission provide to the Western region?

The 10-year Horizon portfolio offers….

- Ability for the region to **accommodate over 30% growth in electricity demand** with a portfolio of resources consistent with Western Utility resource plans.
- Support for **10-years of sustained economic growth**.
- **Reduced threat of reliability-driven power supply disruptions** through the mitigation of over 75 steady-state power flow violations that would occur but for the construction of upgrades identified by WestTEC.
- **Operational improvements** relative to planned lines alone, including a $500 million per year decrease in power production costs
- **Reduction in grid congestion costs** and generation curtailment by 20% and 17%, respectively – these metrics are inherently conservative and do not reflect the full extent of savings and efficiencies that could occur.
- **Ability to reliably transfer an additional ~10 GW of power** across key interregional interfaces during times of system need, which can reduce the risk of power shortages and enable lower planning reserve margins.

10-year Horizon Transmission Portfolio



Implementation and Challenges that Lie Ahead

- **Finding #5: Coordinated Action Can Overcome Development Challenge**
  - Report recommends collaboration on long-lead equipment procurement, regulatory support for early-stage activities, innovative business models, streamlined permitting, and transparent cost allocation and engagement on business case development.

10-year Horizon Report: Recapping Key Takeaways

- WestTEC's participant-led process allowed it to respond to technical findings and deliver an **actionable** 10-year horizon study
- In doing so, it concludes that:
  1. The 10-year horizon portfolio positions the West to meet growing demand, integrate new resources, and strengthen reliability
  2. Timely completion of planned projects in the portfolio is essential
  3. Uncommitted projects require sponsorship and support
  4. Transmission costs are manageable in the right context
  5. Coordinated action can help overcome development challenges

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20-Year Horizon: Study Updates and What to Expect

20-year Horizon: What is different?

- Focus of 2026 is a 20-year horizon assessment, concluding in ~Q3 with publication of report detailing long-term interregional transmission needs for the West
- This assessment:
  - Explores long-term planning scenarios – a solution to address the significant amount of uncertainty facing planners
  - Help understand how transmission needs change in response to planning variables
  - Allows for continued evaluation and right-sizing of 10-year horizon upgrades
  - Identify long-lead transmission that is “least regrets”
  - Forecasts benefits of key transmission portfolios

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WestTEC 20-Year Scenarios

	Reference	Flux	Core
Narrative	**A baseline scenario reflecting reasonably anticipated trends in load growth, technology, and policy**	**A high-growth scenario reflecting rapid changes in power demand and technology innovation**	**A moderate-growth scenario with select technology breakthroughs**
Load Growth (2025-2045)	2.2% per year (56% increase)	3% per year (80% increase)	2% per year (48% increase)
Technology Costs	Moderate innovation trajectory	Advanced innovation trajectory	Conservative innovation trajectory* (No Tax Credits) *Breakthroughs in Storage, Advanced Geothermal, Nuclear SMRs, and CCS
GHG Policies	Statutory	Statutory & voluntary	Statutory with 5-year compliance delay

Thank You