

Central California Clean Energy Transmission Project (C3ETP)
1st Stakeholder Meeting, Jan 9th, 2008, Folsom CA

Study Plan



Department of Planning and Infrastructure Development, CAISO



California ISO
Your Link to Power

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January 9, 2008

Central California Clean Energy Transmission Project (C3ETP)

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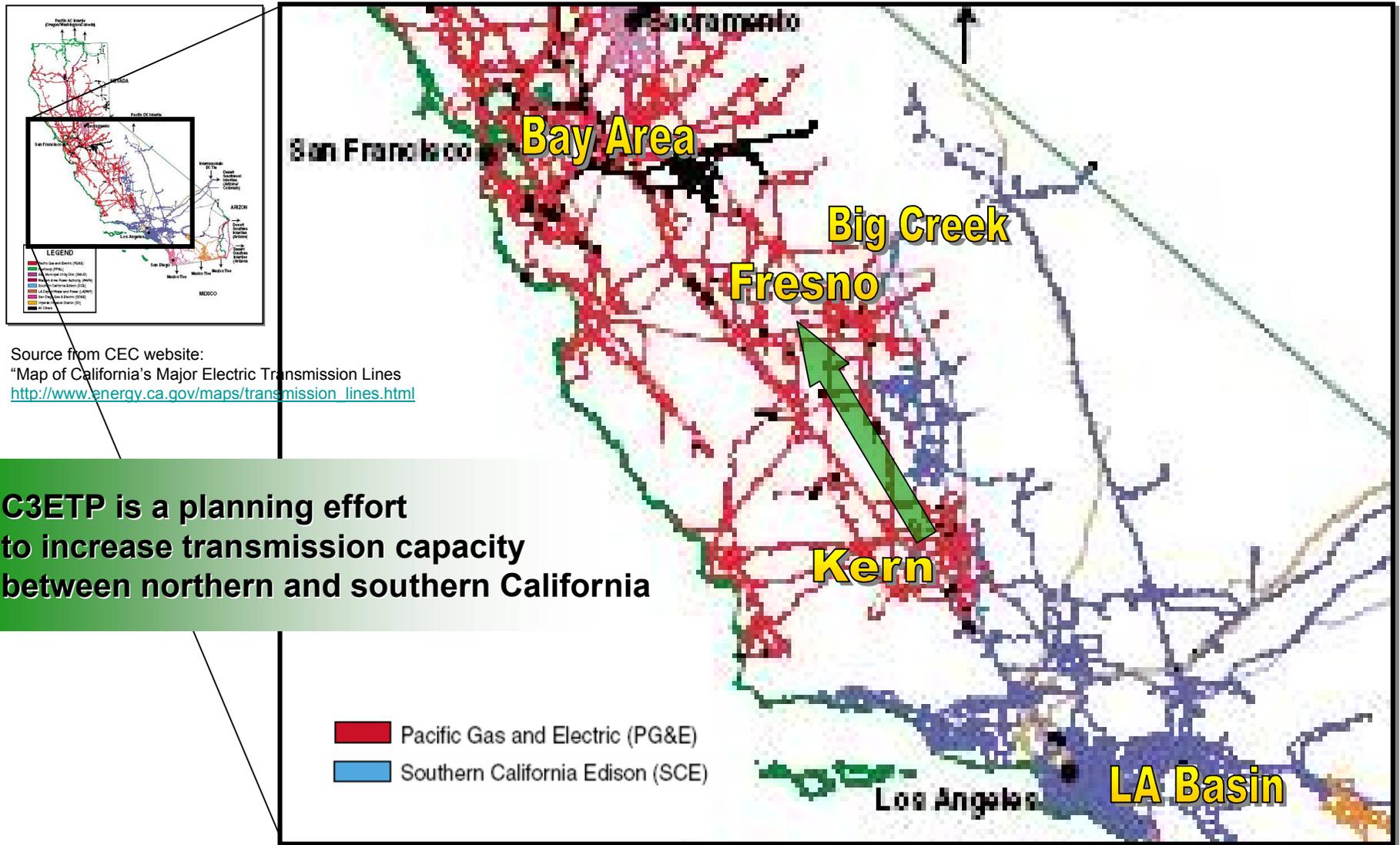
The Planning Task

Status of the System

Proposed Alternatives



Central California Clean Energy Transmission Project (C3ETP)



C3ETP Objectives

Vision:

Access renewables in southern California

Serve load growth in the Fresno area

Maximize utilization of Helms pumped-storage plant

Future expansion of the California transmission system

Observations:

Massive buildup of renewables

Significant congestion exists, especially around the Fresno area

A need for new transmission is clearly demonstrated

A project can be defined that benefits both PG&E and SCE

Planning Principles and Standards

The Nine Principles FERC Order 890



1. Coordination
2. Openness
3. Transparency
4. Information Exchange
5. Comparability
6. Dispute Resolution
7. Regional Participation
8. Economic Planning Studies
9. Cost Allocation

Planning Standards

CAISO Planning Standards

WECC Planning Standards

NERC Planning Standards

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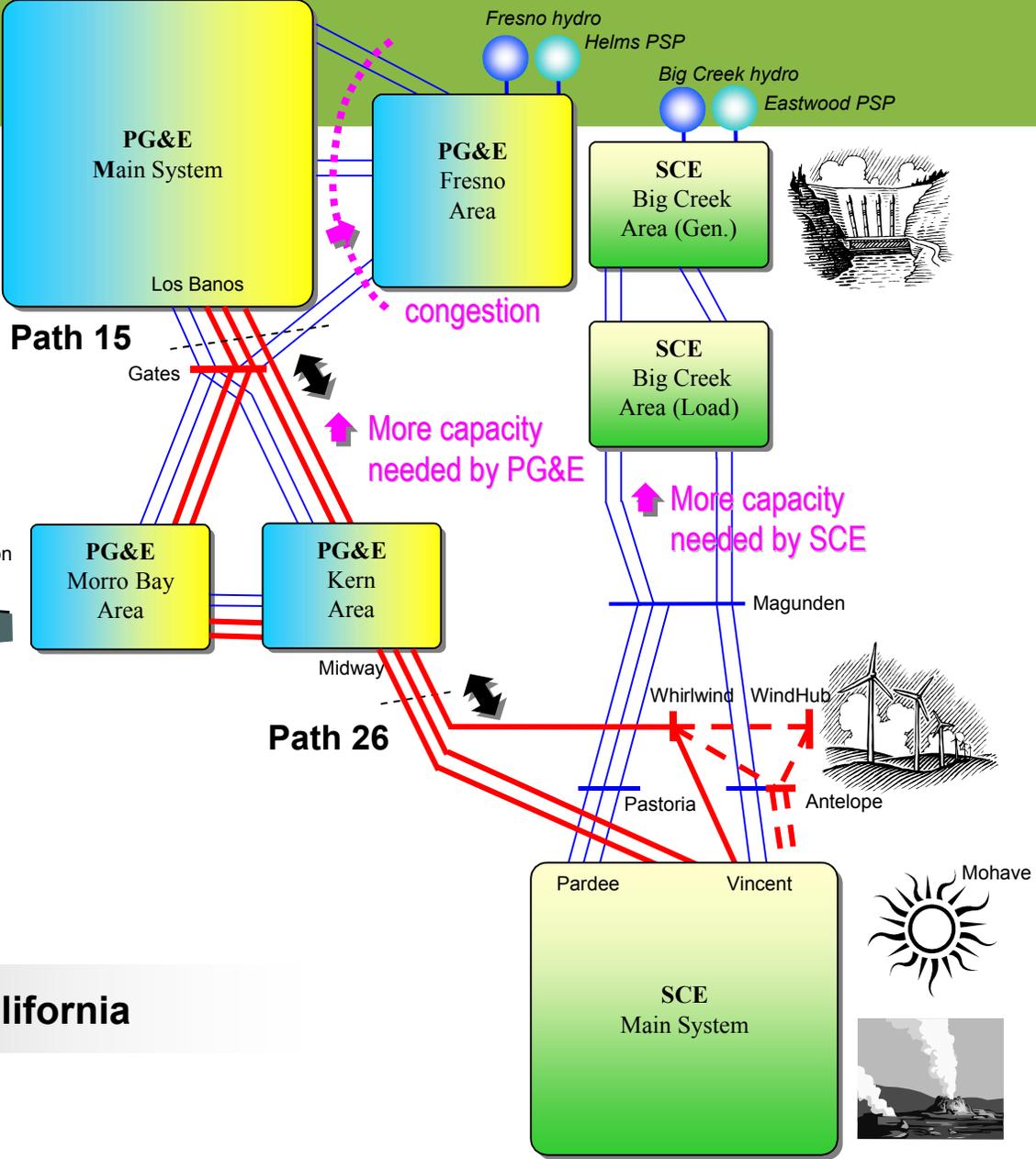
Central California Clean Energy Transmission Project (C3ETP)

Northern California



Southern California

C3ETP is a planning effort to increase transmission capacity between northern and southern California.



Transmission System in Central California

Status of the System



PG&E Transmission System (Fresno Area):

- ▶ Congested imports and constrained Helms pumping operation
- ▶ Challenge to meet growing load demand in the Fresno area
- ▶ Prospect and uncertainties of new generation in the Fresno area
- ▶ New transmission capacity needed to relieve congestion



SCE Transmission System (Big Creek Area):

- ▶ Meet growing load demand in the San Joaquin area
- ▶ Mitigate existing transient voltage issues in the Rector area
- ▶ Mitigate existing power oscillations of Big Creek generators



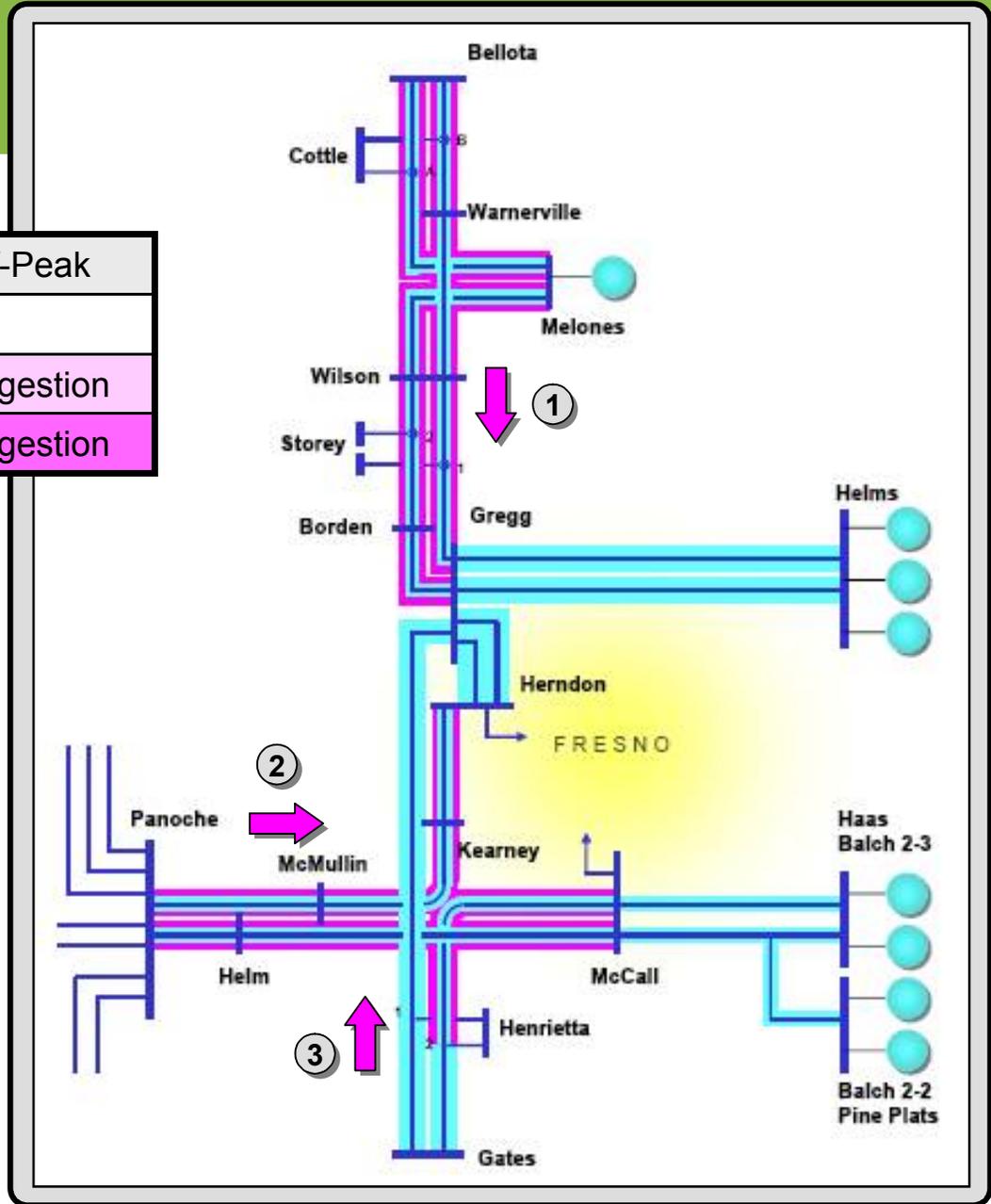
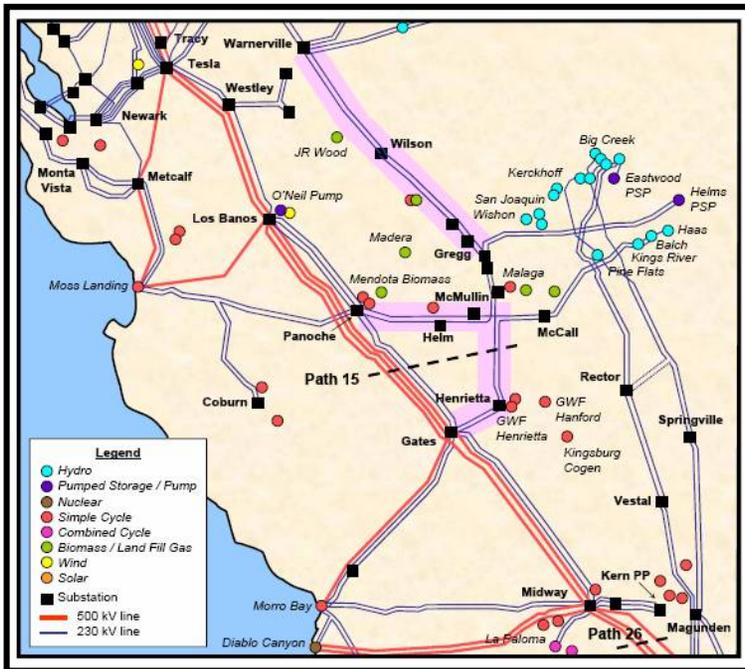
Transmission Interface between PG&E and SCE systems:

- ▶ Path 15 – future congestion?
- ▶ Path 26 – future congestion?

Fresno Transmission

Typical Congestion Period:

	Peak	Shoulder-Peak	Off-Peak
①	Congestion	Congestion	
②	Congestion	Congestion	Congestion
③	Congestion	Congestion	Congestion



Fresno Load

Greater Fresno Area Load Growth

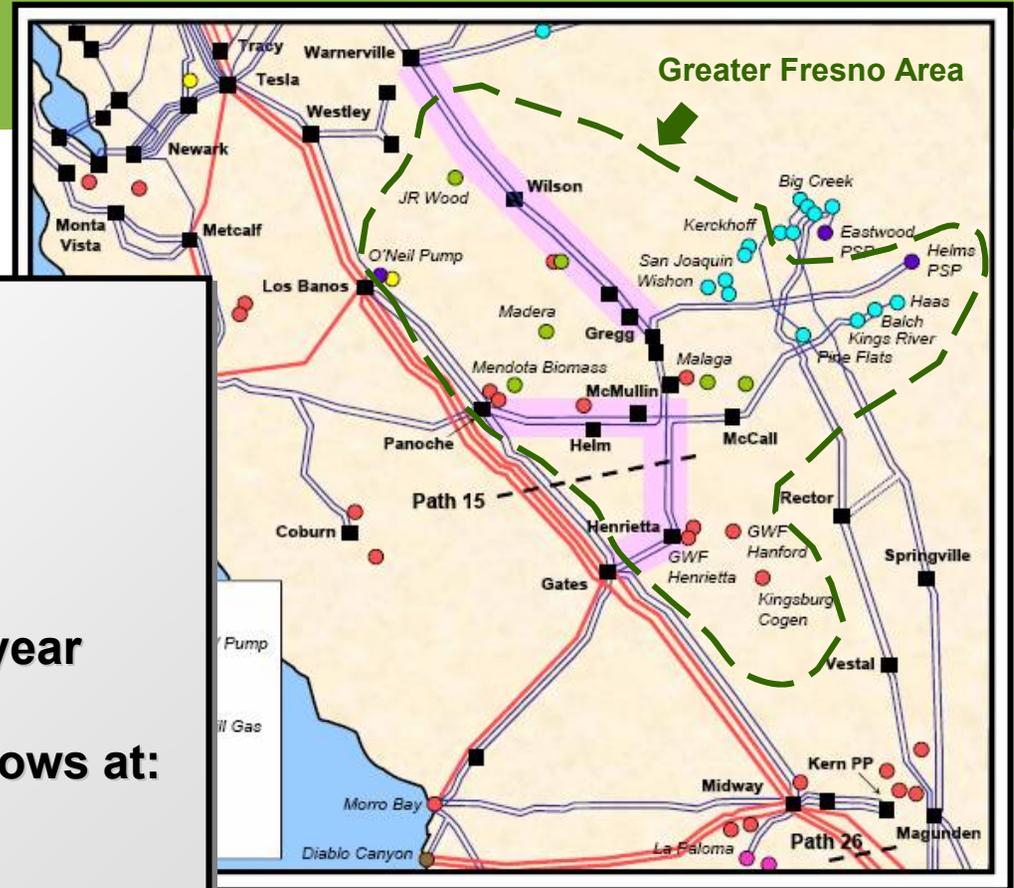
According to PG&E's forecast, the load growth for the area is expected to be about 1.5% per year

In each year, the 1-in-10 load grows at:

+45 MW for **summer peak**

+23 MW for **summer off-peak**

As a result, each year congestion is becoming more severe and the Helms pumping window continues to grow narrower



Fresno Generation

New Generation in the CAISO LGIP Queue (as of 12/31/2007)

Queue Position	Point of Interconnection	Net Capacity (MW)	Online Date	Type	Status
42	McCall Substation	303.0	2013	CT	LGIA
47	Herndon – Kearney 230 kV line	200.0	2009	CT	PPA
52	Panoche Sub Station	401.0	2009	CT	PPA
54	Panoche Substation	119.9	2009	CT	PPA
61	70 kV Helm-Kerman	73.3	2006	ST	Online
75	Le Grand-Chowchilla 115 kV	10.5	2008	B	UC
76	PG&E Merced #1 70 kV circuit	10.5	2008	B	UC
128	McCall Substation	565.0	2010	CC	FAS
196	230 kV bus at Borden Substation	508.0	2011	CC	IFS
247	Borden Substation 230 kV Bus	57.0	2011	CC	SIS
272	Henrietta Substation	125.0	2010	S	IFS
272	Henrietta Substation	25.0	2012	CC	IFS
273	Henrietta-Kingsburg 115 kV lines	75.9	2010	S	SIS
273	Henrietta-Kingsburg 115 kV lines	24.0	2012	CC	SIS
TBD	115 kV Panoche Sub	29.0	2010	B	IR

According to the CAISO Grid Planning Standard, these projects will be modeled in the base case.

Other new generation will not be modeled in the base study case.

Type:

CT: Combustion turbine
 ST: Steam turbine
 CC: Combined cycle
 B: Biomass
 S: Solar

Status:

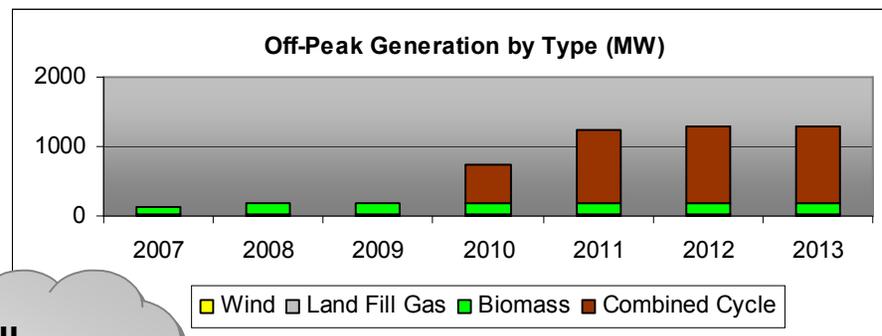
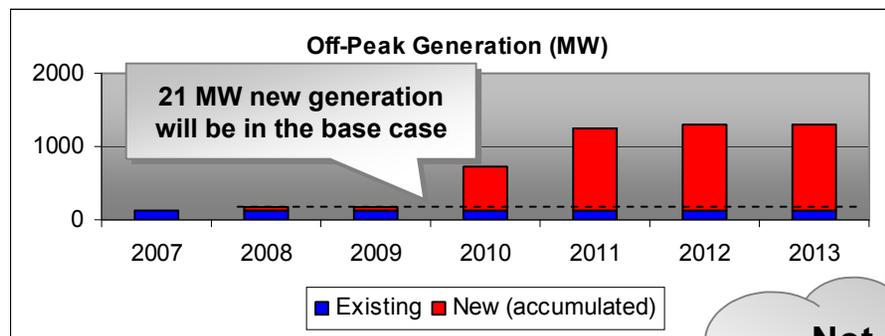
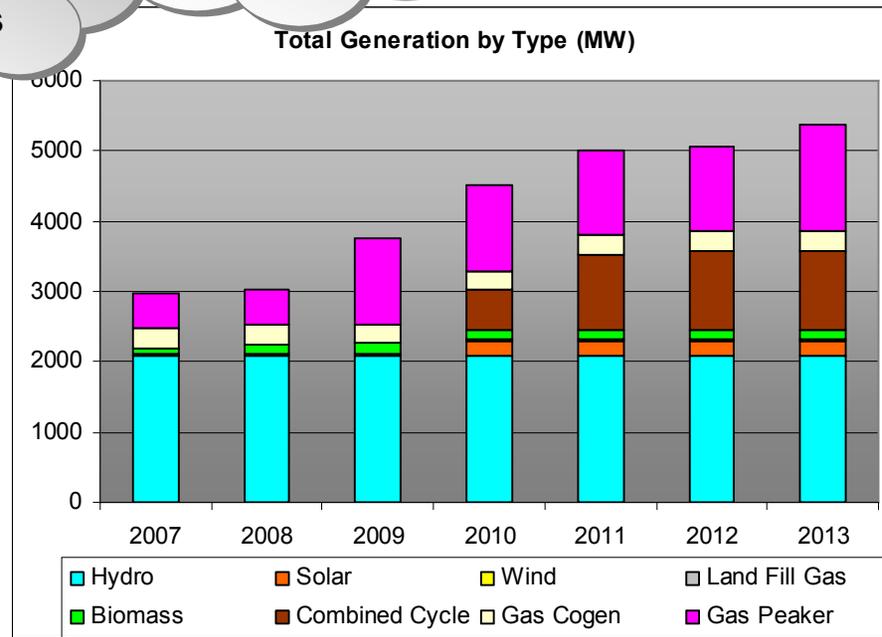
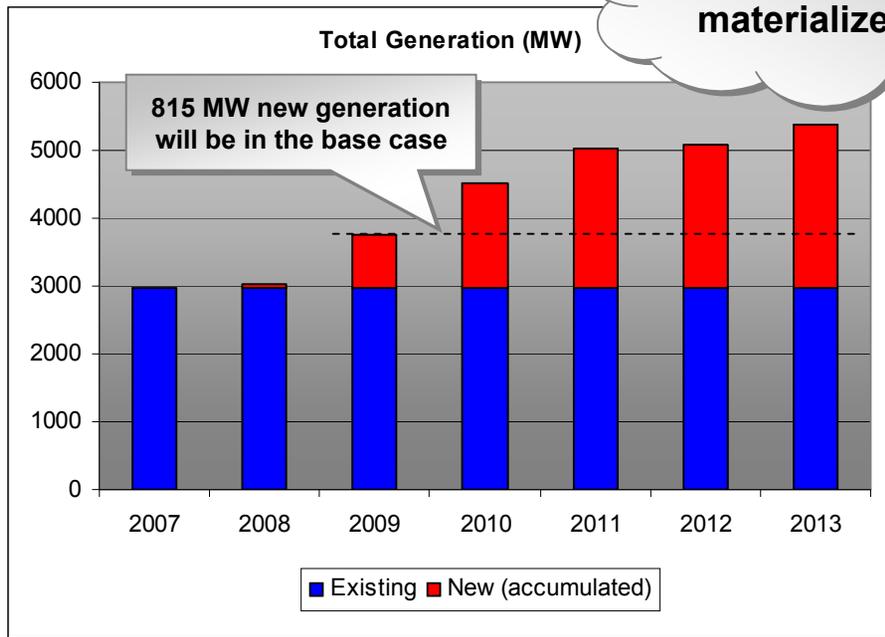
IR: Interconnection Request
 IFS: Interconnection Feasibility Study
 SIS: System Impact Study
 FAS: Facilities Study
 LGIA: Large Gen. Intercon. Agreement
 PPA: Power Purchase Agreement
 UC: Under Construction



Fresno Generation Existing and New

No one is certain if new generation materializes

No info about any new generation beyond 2013



Not all generation operate in off-peak

Why More Transmission Capacity Needed? See the Following Example

In operations, the following constraints were observed during summer off-peak:

- ▶ The 3rd Helms pump (300 MW) cannot be operated due to congestion
- ▶ Even sometimes, none of the three Helms pumps (900 MW) can be operated

Rough estimates of needed new transmission capacity for summer off-peak:

	Low Estimate	High Estimate
2007	300 MW	1000 MW
2017	530 MW	1230 MW
2027	760 MW	1460 MW
2037	980 MW	1690 MW

Note: The above estimates are based on the following assumptions:

- (1) There is no new base-load generation (that operates in off-peak) built in the Fresno Area from 2007 to 2037
- (2) In summer off-peak, the area's load growth is about 23 MW per year

Most importantly, there is not only a need for Transmission capacity in Fresno, but a long-term regional need as well

Path 15 and Path 26

Path 15 consists of:

- Los Banos – Midway 500 kV line
- Los Banos – Gates 500 kV line #1
- Los Banos – Gates 500 kV line #2
- Panoche – Gates 230 kV line #1
- Panoche – Gates 230 kV line #1
- Gregg – Gates 230 kV line
- McCall – Gates 230 kV line

Path 15 ratings:

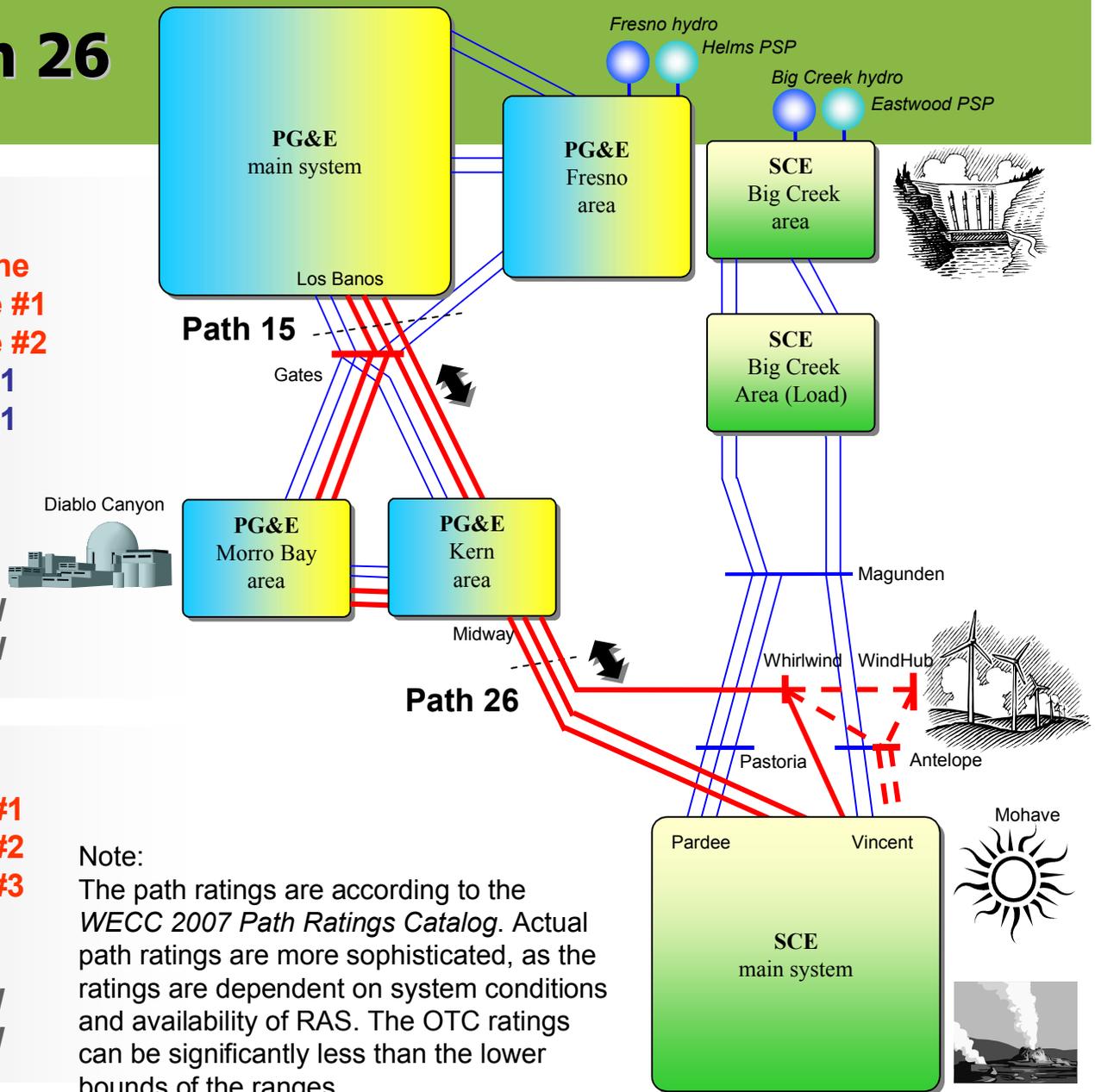
- North-to-South: 2000-3265 MW
- South-to-North: 4800-5400 MW

Path 26 consists of:

- Midway – Vincent 500 kV line #1
- Midway – Vincent 500 kV line #2
- Midway – Vincent 500 kV line #3

Path 26 ratings:

- North-to-South: 900-4000 MW
- South-to-North: 1400-3000 MW



Note:

The path ratings are according to the *WECC 2007 Path Ratings Catalog*. Actual path ratings are more sophisticated, as the ratings are dependent on system conditions and availability of RAS. The OTC ratings can be significantly less than the lower bounds of the ranges.

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Proposed Alternatives



Proposed Alternatives

1: Status Quo

2: Midway – E2 500 kV DCTL

3: Midway – E2 500 kV SCTL

4: Whirlwind – E2 500 kV DCTL

5: Midway – E2 230 kV DCTL

6: Fresno – Big Creek 230 kV inter-tie

7: Midway – McCall – E2 230 kV DCTL

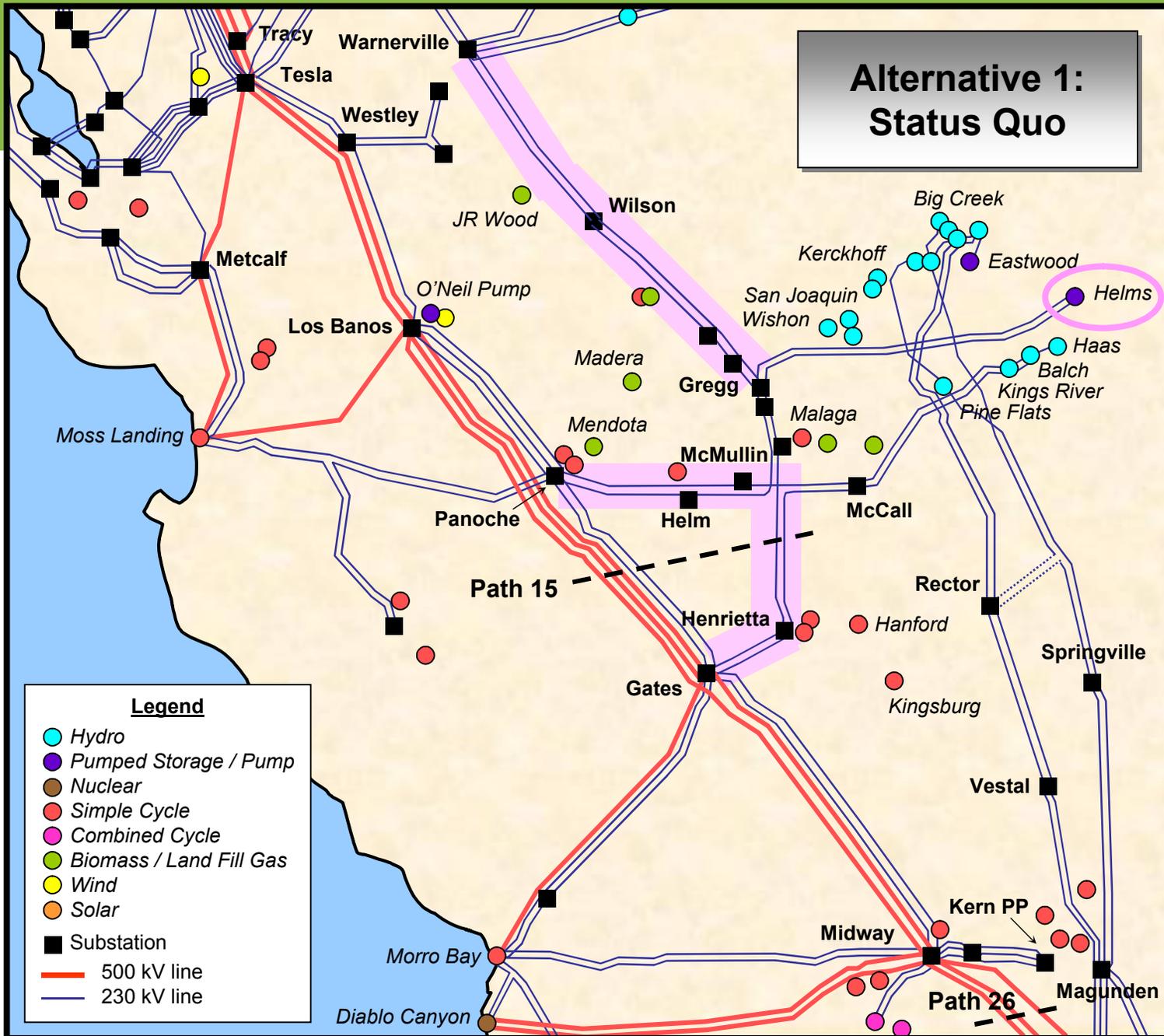
8: Gates – Gregg 230 kV DCTL

9: Raisin 230 kV Switching Station

10: New generation of 565 MW in Fresno



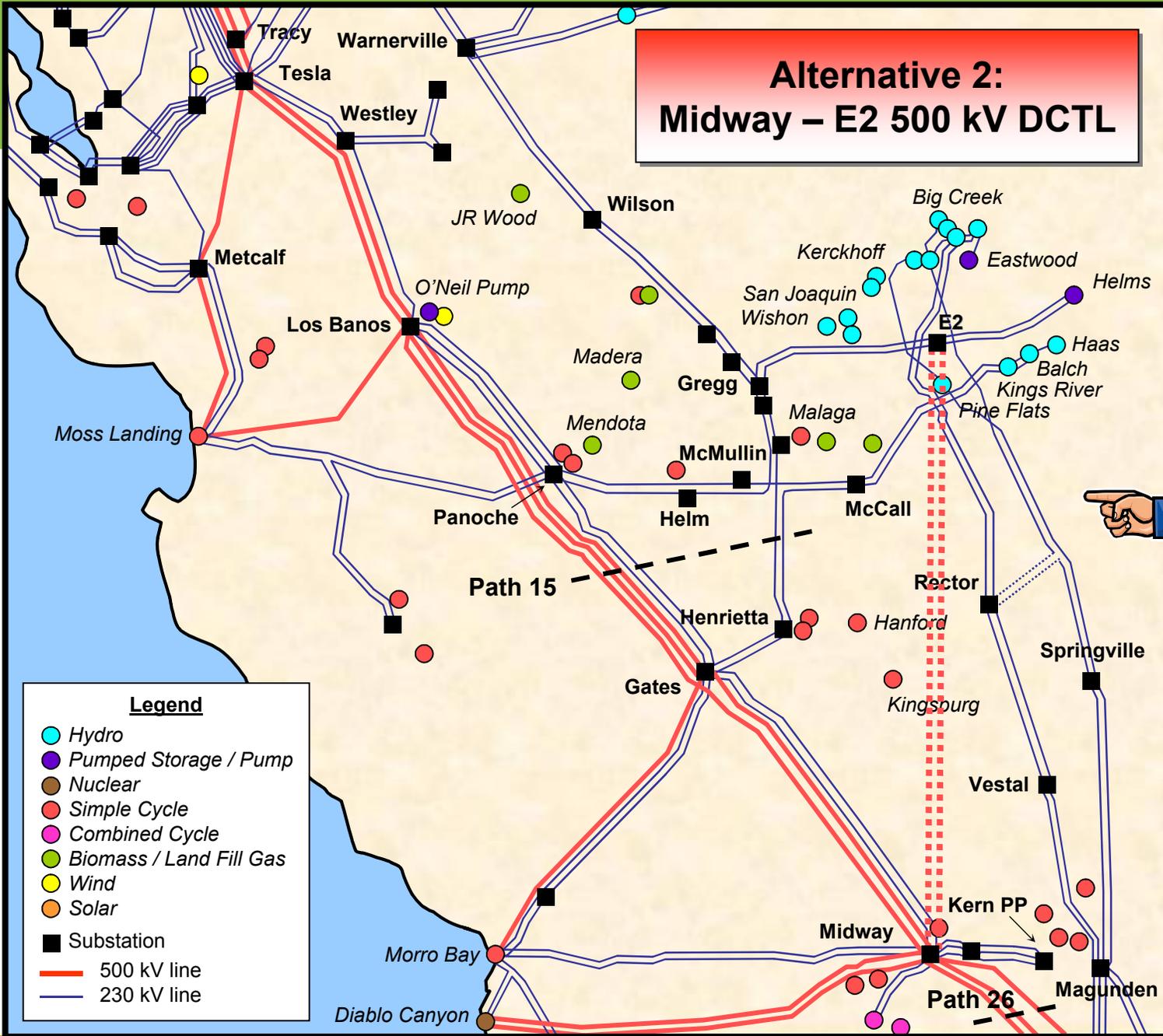
Alternative 1: Status Quo



Note: This map is approximate and conceptual.

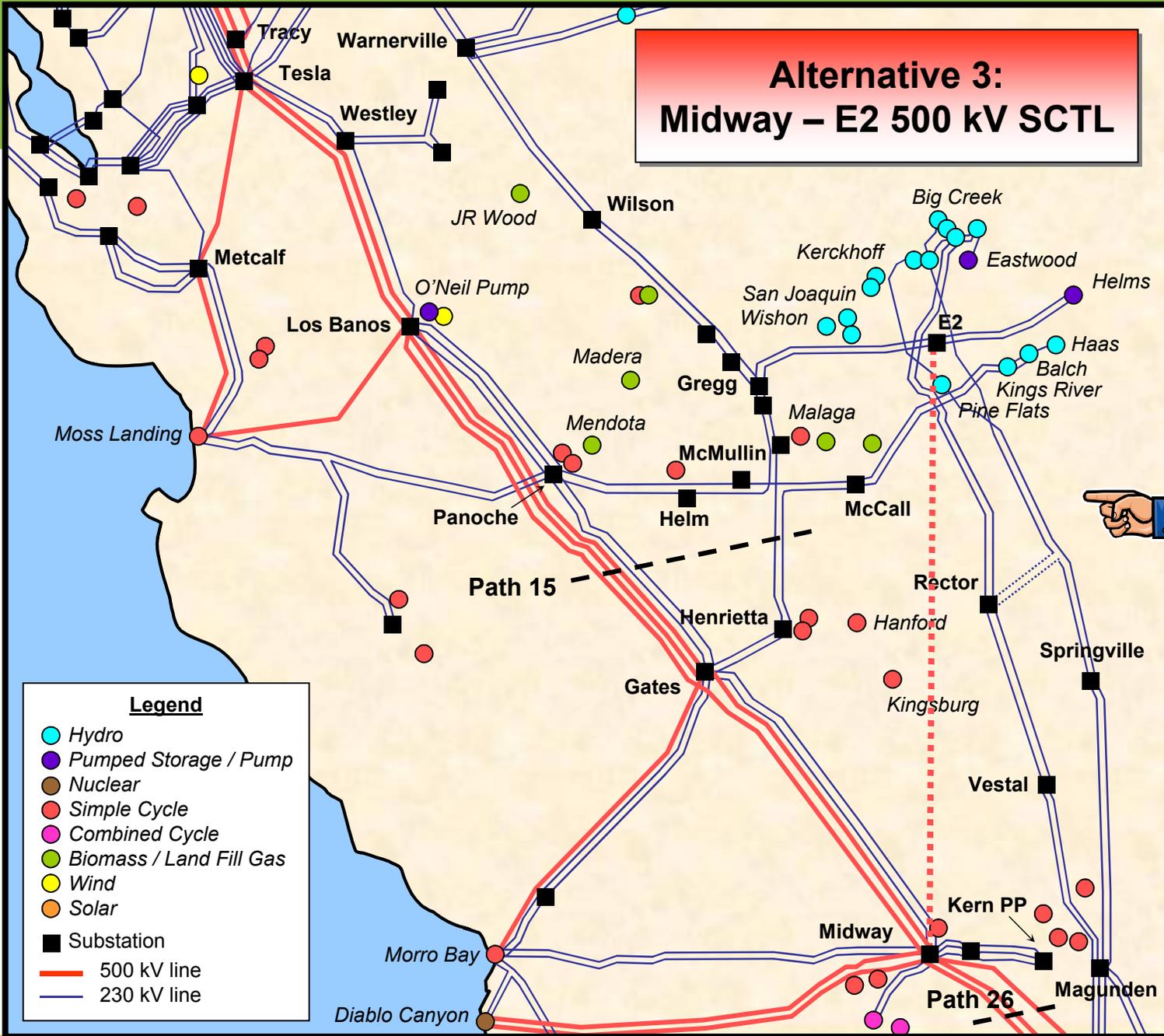


Alternative 2: Midway – E2 500 kV DCTL



Note:
This map is approximate.
The illustrated new lines do not represent the transmission routes.
The illustrated new sub station does not represent the exact location.

Alternative 3: Midway – E2 500 kV SCTL



Legend

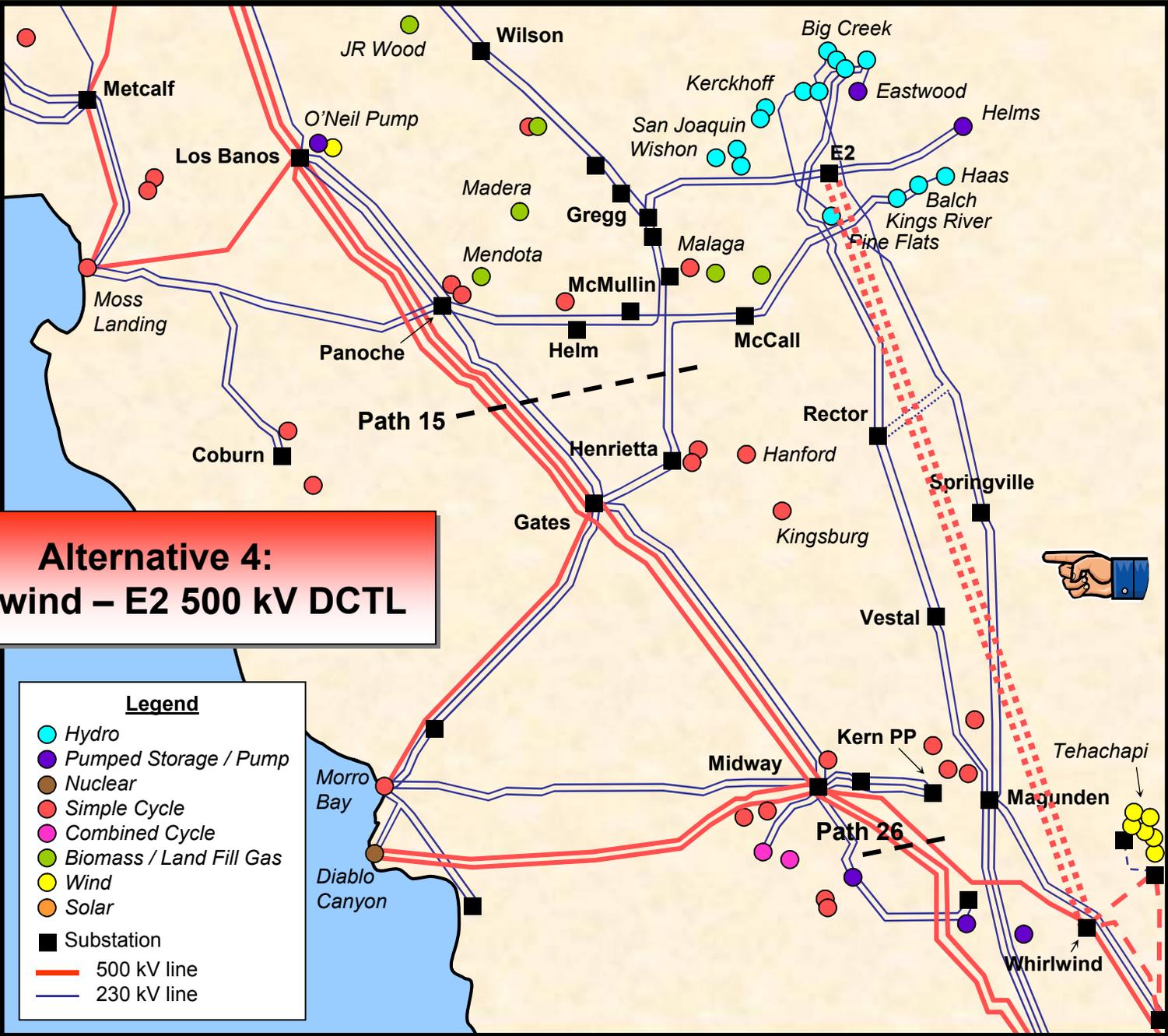
- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line

Note:
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The illustrated new sub station does not represent the exact location.

Alternative 4: Whirlwind – E2 500 kV DCTL

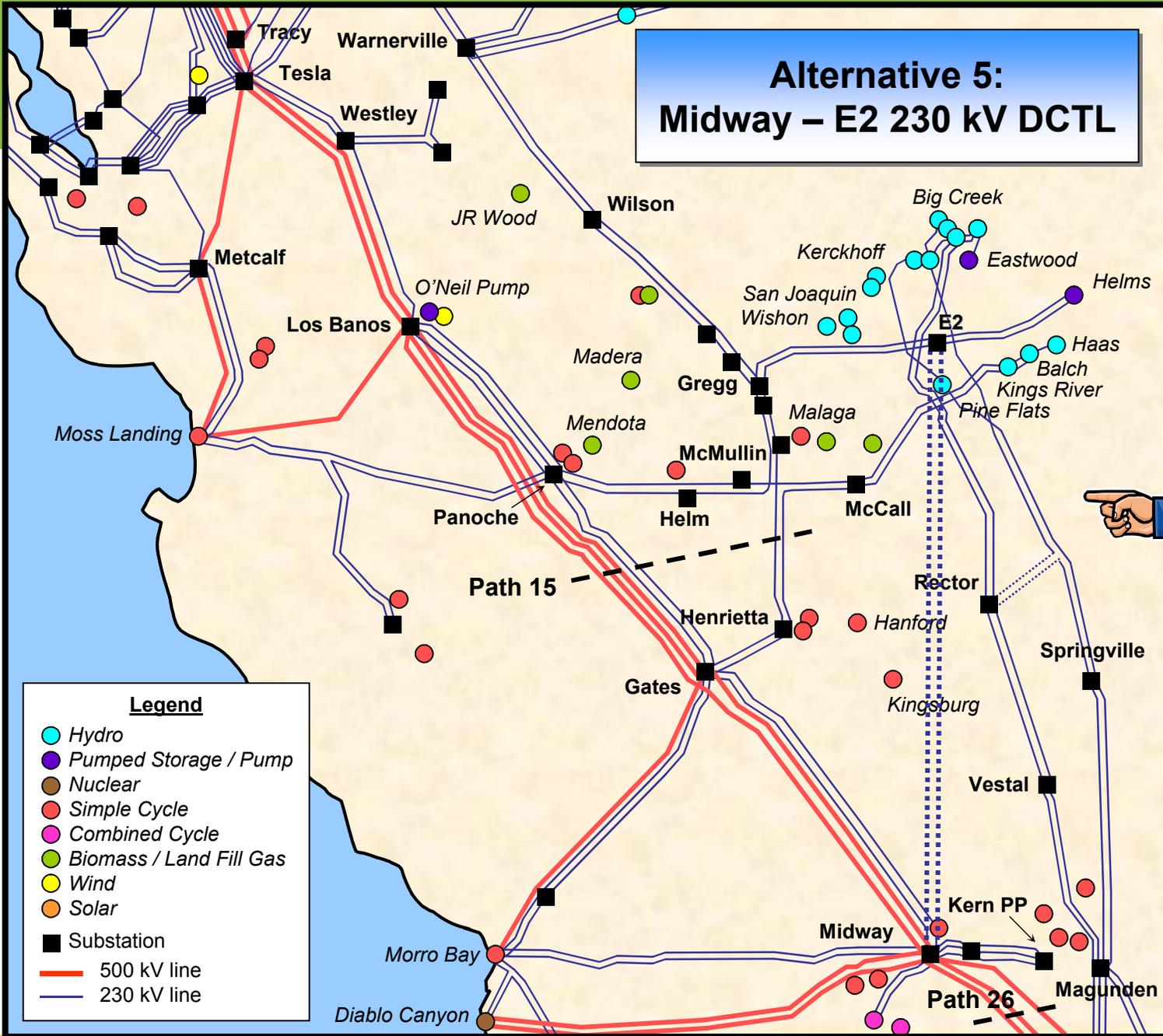
Legend

- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line



Note:
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The illustrated new substation does not represent the exact location.

Alternative 5: Midway – E2 230 kV DCTL

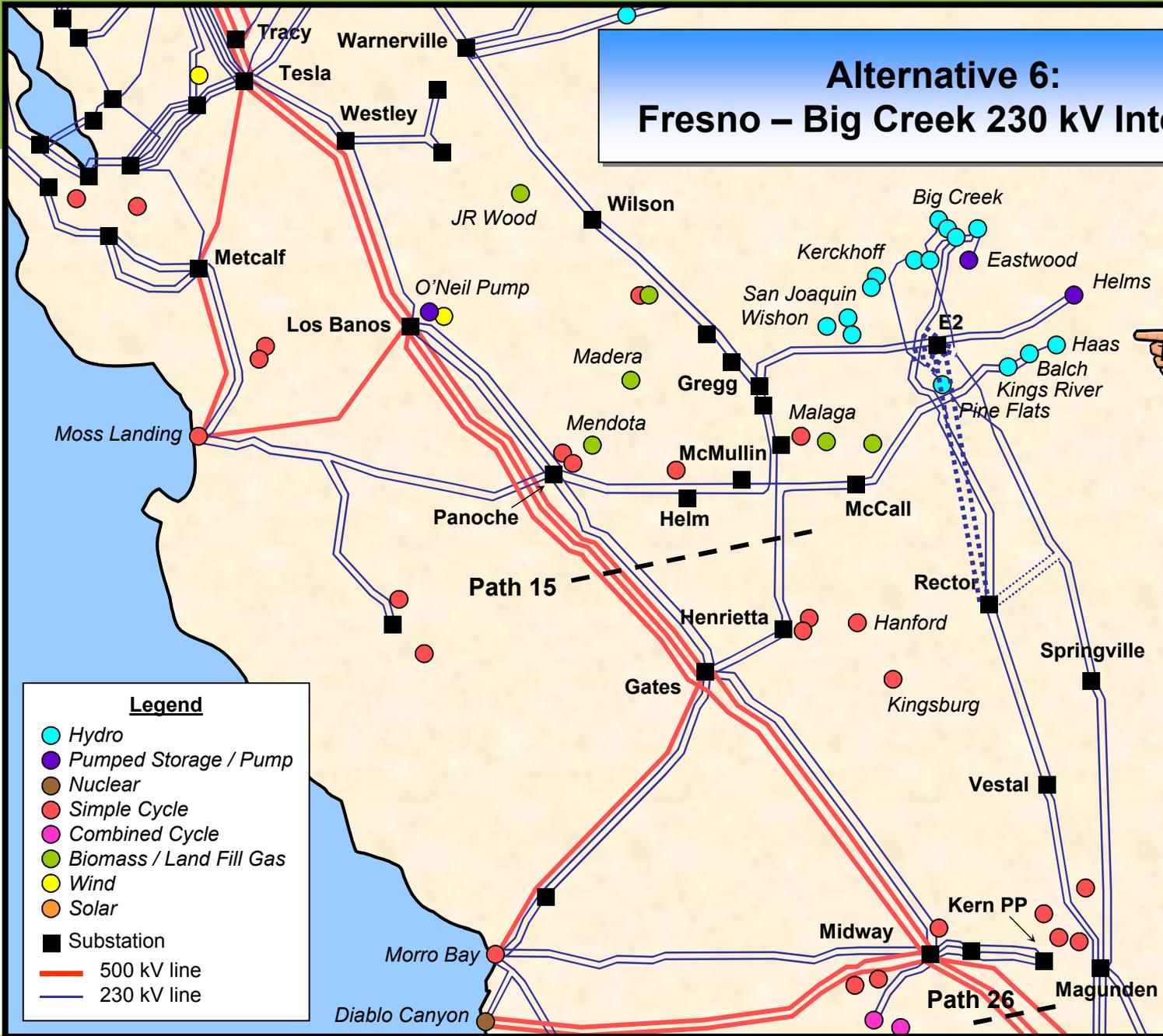


Legend

- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line

Note:
This map is approximate.
The illustrated new lines do not represent the transmission routes.
The illustrated new switching station does not represent the exact location.

Alternative 6: Fresno – Big Creek 230 kV Inter-tie



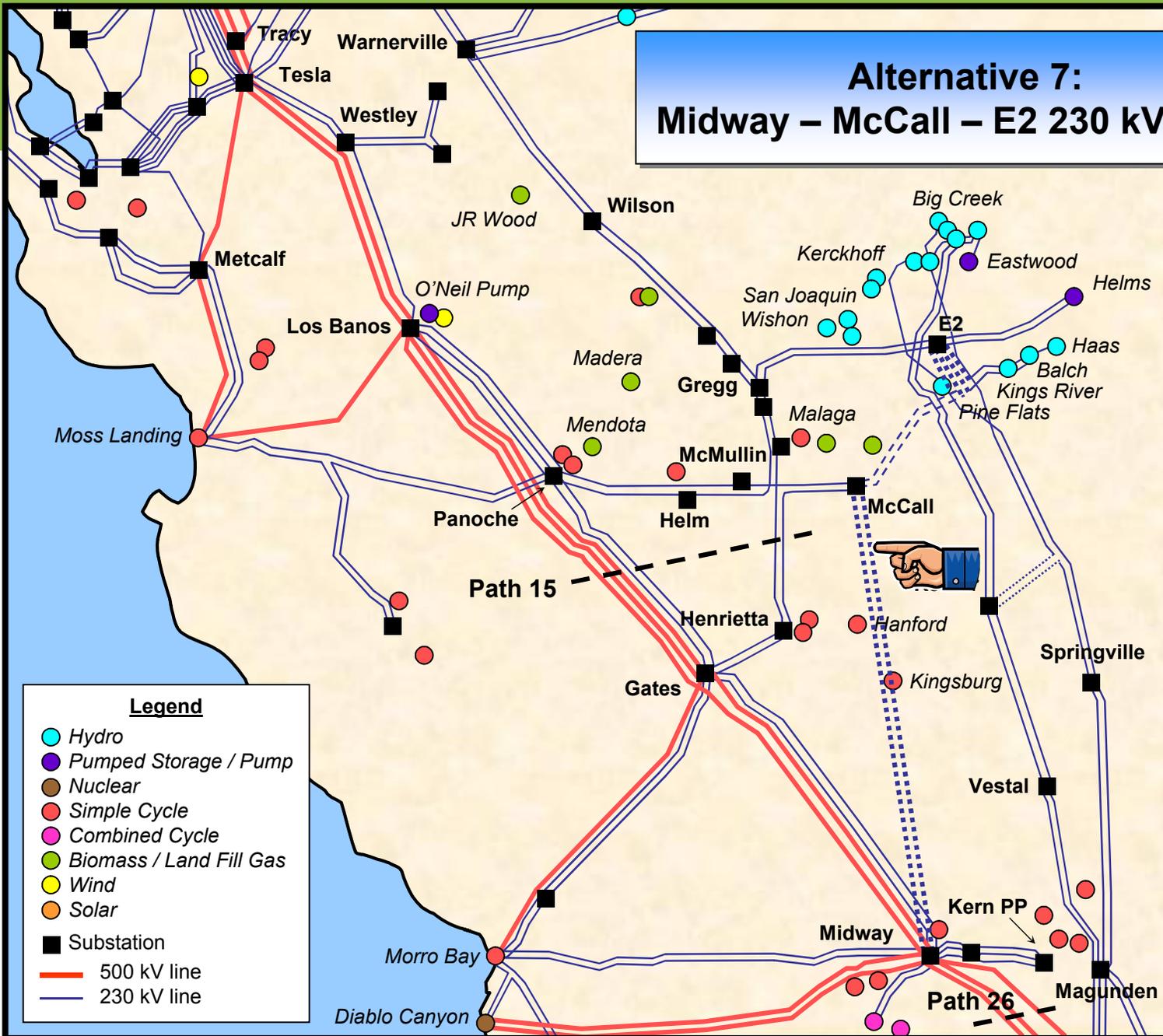
Legend

- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line



Note:
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Alternative 7: Midway – McCall – E2 230 kV DCTL

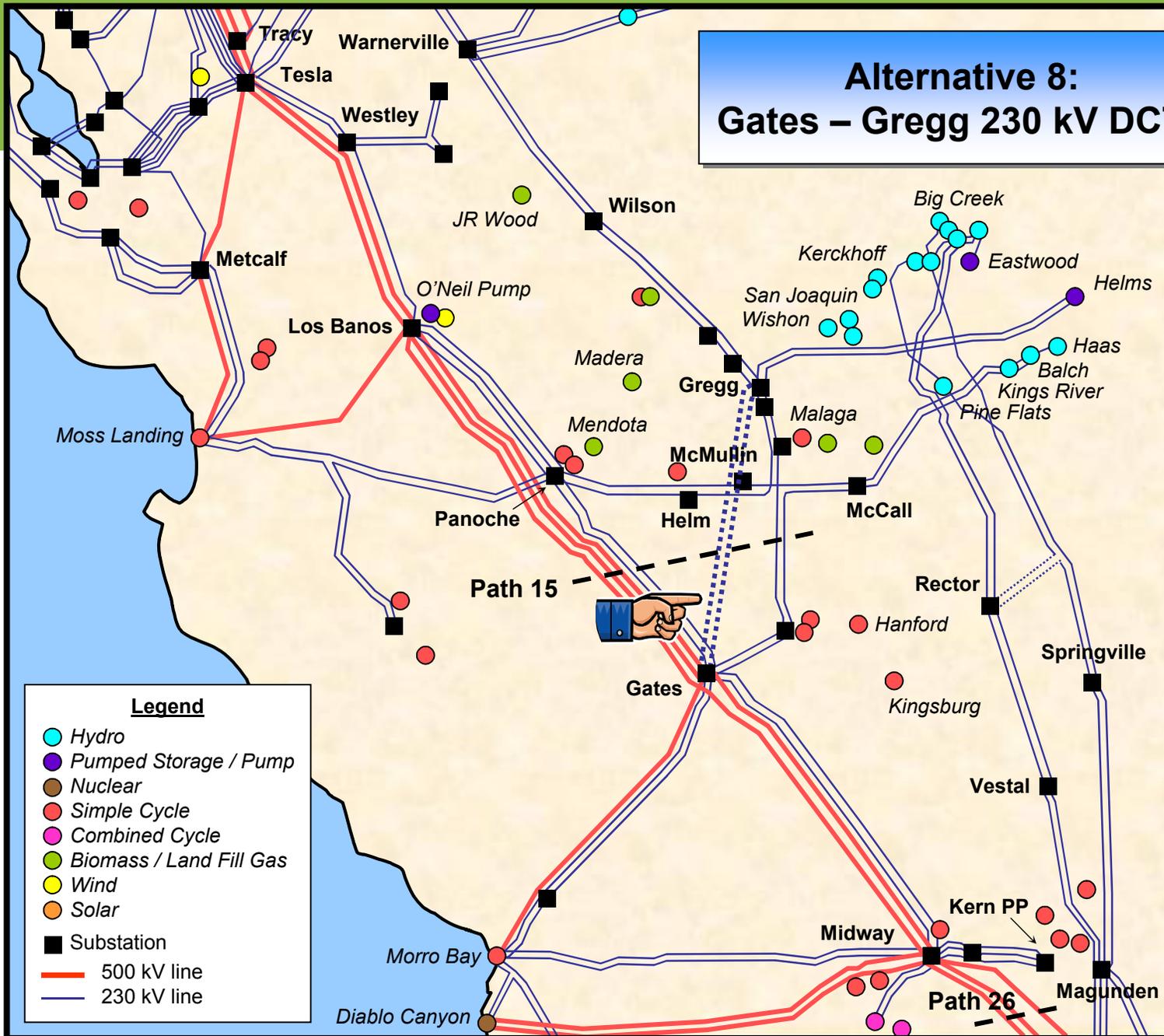


Legend

- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line

Note:
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The illustrated new switching station does not represent the exact location.

Alternative 8: Gates – Gregg 230 kV DCTL

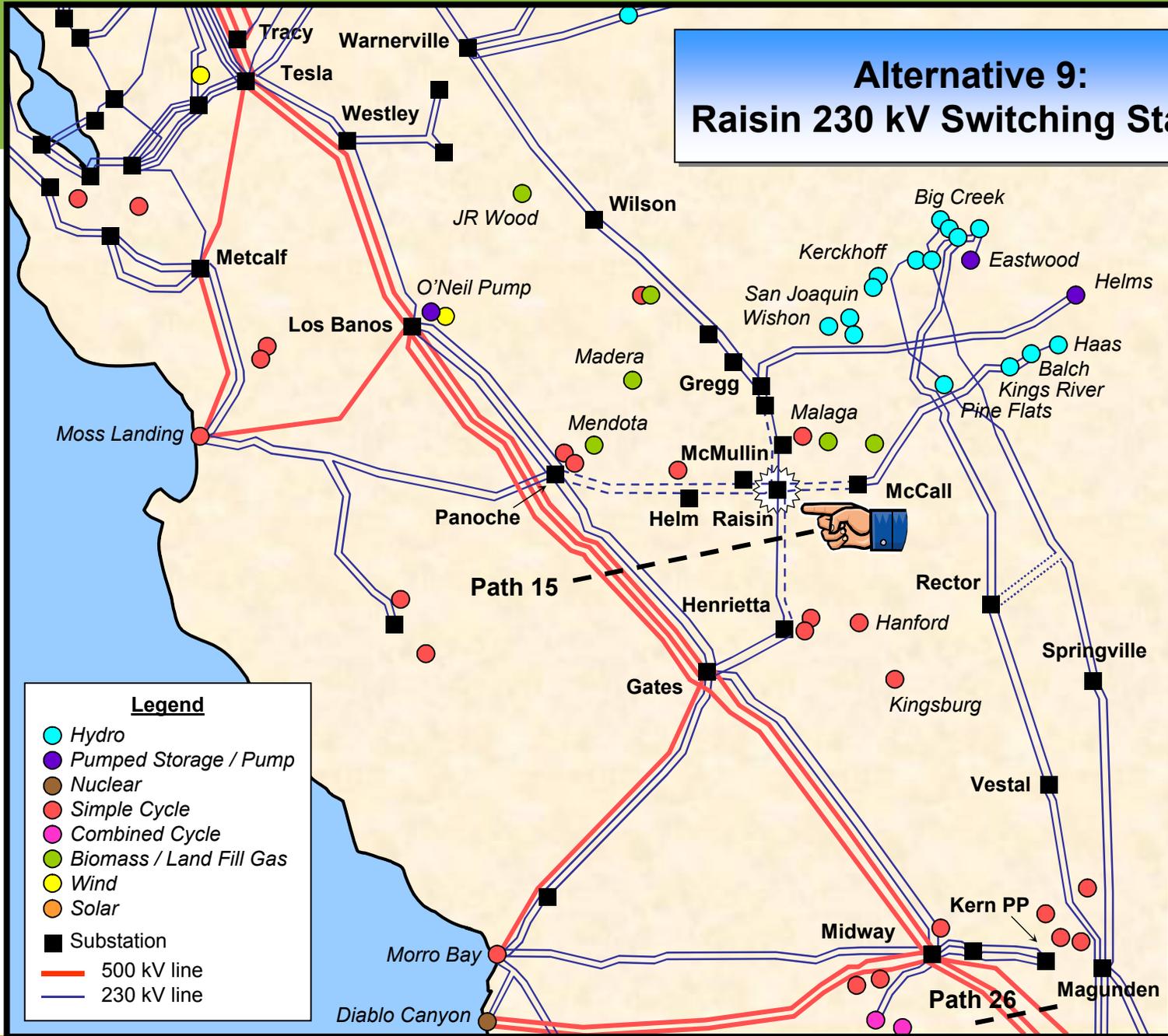


Legend

- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line

Note:
This map is approximate.
The illustrated new lines do not represent the transmission routes.

Alternative 9: Raisin 230 kV Switching Station

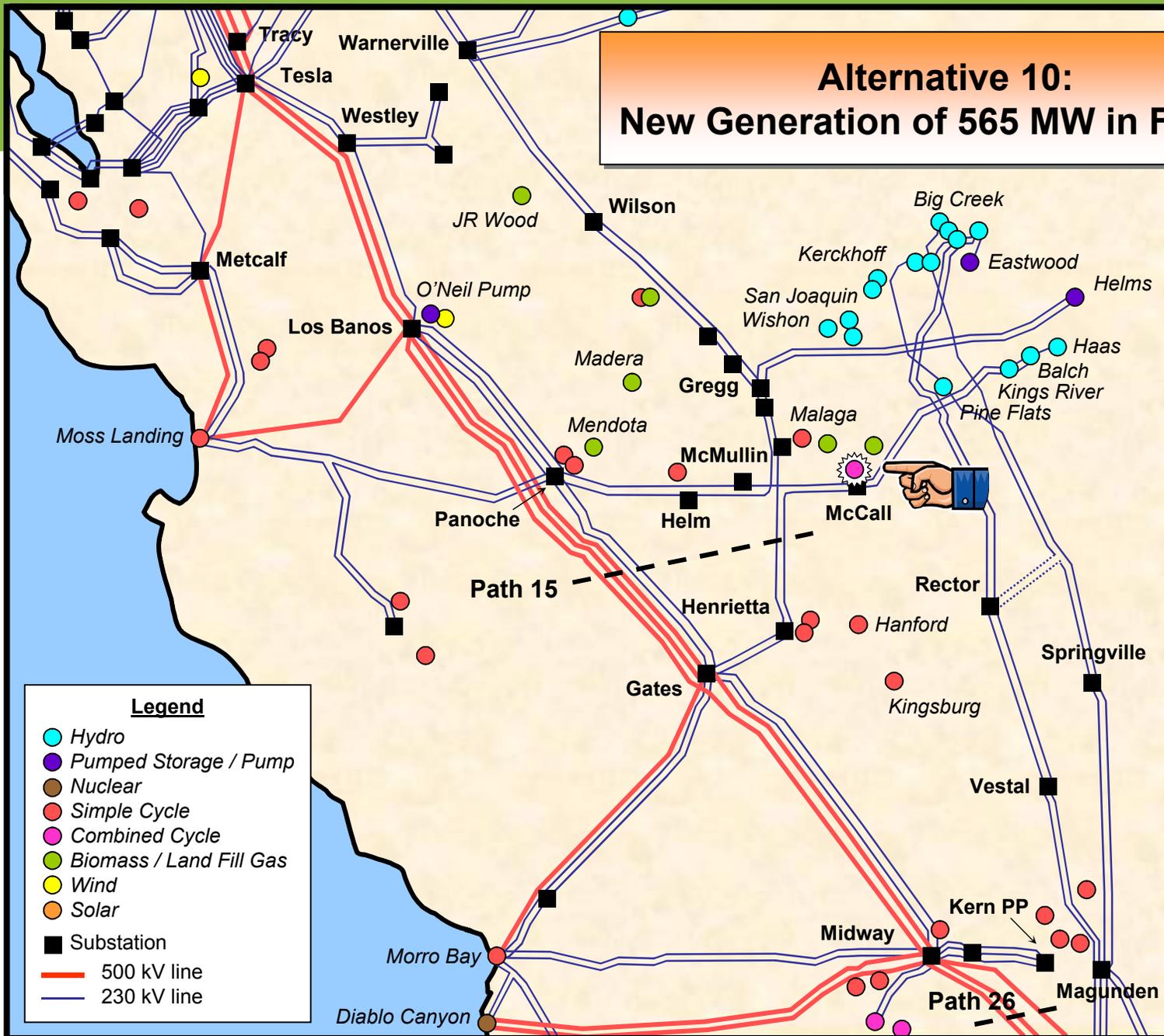


Legend

- Hydro
- Pumped Storage / Pump
- Nuclear
- Simple Cycle
- Combined Cycle
- Biomass / Land Fill Gas
- Wind
- Solar
- Substation
- 500 kV line
- 230 kV line

Note:
 This map is approximate.
 The illustrated new switching station does not represent the exact location.

Alternative 10: New Generation of 565 MW in Fresno



Note:
This map is approximate.
The illustrated new generation does not represent the exact location of the power plant..

Finding the Best Alternative

Which alternative is the best?

We really don't know yet!

———— **Let's study and compare!** ————

Reliability Assessment

Economic Assessment

Central California Clean Energy Transmission Project (C3ETP)

Your comments and questions are welcome



For written comments, please send to: RegionalTransmission@caiso.com