PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

PacifiCorp Transmission Technical Workshop

RFP – Attachment 20

February 22, 2012

Presented by PacifiCorp Transmission

PacifiCorp Transmission Update

- Integrated Resource Plan
- Attachment 20 – Point of Receipt Detail
- Interconnection Request - Study Information

Integrated Resource Plan

Attachment 20 Methodology

- PacifiCorp IRP - identified points of receipt for potential resource and load bubble needs
- High level planning review of the required transmission infrastructure needs required to deliver the resource to adjacent network load bubbles
- The infrastructure additions assume one resource located in the general geographic area

Integrated Resource Plan

- Attachment 20 represents proxy results only
  - Indentified infrastructure requirements
  - Resulting estimated costs
- Any off-system resources require firm transmission through any third party provider as required to deliver to points of receipt identified in Attachment 20
- Attachment 20 costs will be used as one data point by independent evaluators to short list projects

Study Result Accuracy

- Reviews based on existing information, i.e. past studies (local and regional) and known information on the existing system capabilities
- Generator specifics, size, actual interconnection configuration, and queue priority were not known at the time Attachment 20 was prepared
- Actual interconnection system impact study is more in depth and results may/will change requirements
  - LGIA studies include: load flow, fault study, stability, and impacted system analysis that determine final infrastructure needs

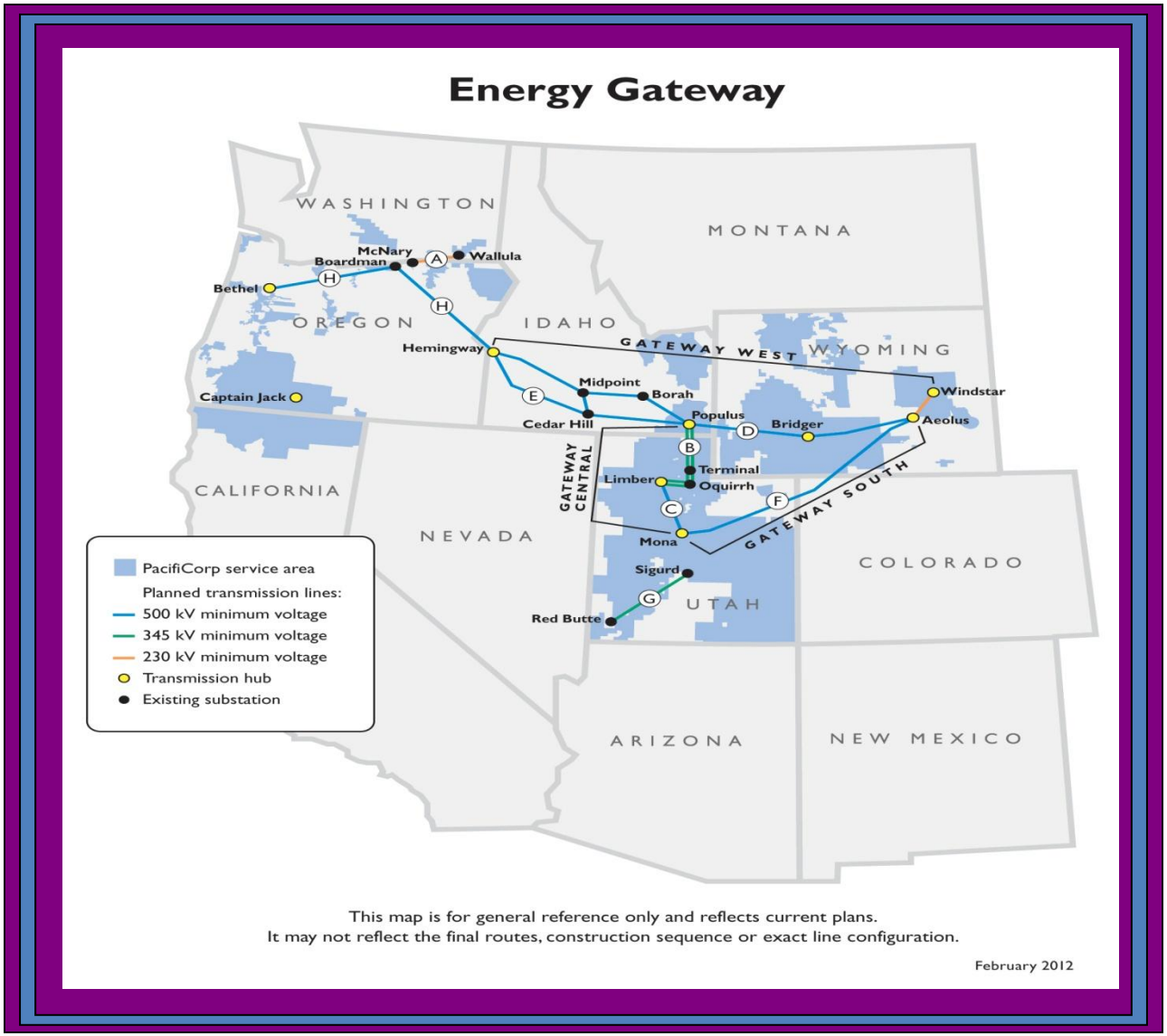
Cost Estimate

- Energy Gateway project costs are excluded from Attachment 20 integration costs
- Cost of project required to serve customer load and identified at the time Attachment 20 was developed are excluded from Attachment 20 integration costs
- Estimates use PacifiCorp's estimating tool based on high level information with very generic project scope (no engineering design, delivery strategy unknown)
- Recent vendor quotes, material and labor costs continue to change over historic trends
- Costs are based upon requirements without complete design from study requirements or from a facility design (without line routes, final structures, equipment requirements, etc)

Summary –

Estimates are based on applying standard cost data for what is known at this time and are subject to change when detailed studies are conducted

Energy Gateway Project Topology



Relevant Transmission Projects

Projects web page: http://www.pacificorp.com/tran/tp.html

Priority One **Base Load Service and Reliability**	**Gateway Segments**	
	■Segment B (Populus to Terminal 345-kV)	In Service
	■Segment C (Mona to Oquirrh 500/345-kV)	2013
	■Segment G (Sigurd to Red Butte 345-kV)	2015
	Other Projects	
	■Wallula to McNary 230-kV	2012-13
	■Vantage to Pomona Heights 230-kV	2013

Priority Two **Resource Integration and Adequacy**	**Gateway Segments**	
	■Segment D (Windstar to Populus 500-kV)	2015-17
	■Segment E (Populus to Hemingway 500-kV)	2015-18

Attachment 20

Transmission Integration Costs
Background Information

Draft version 9-2011

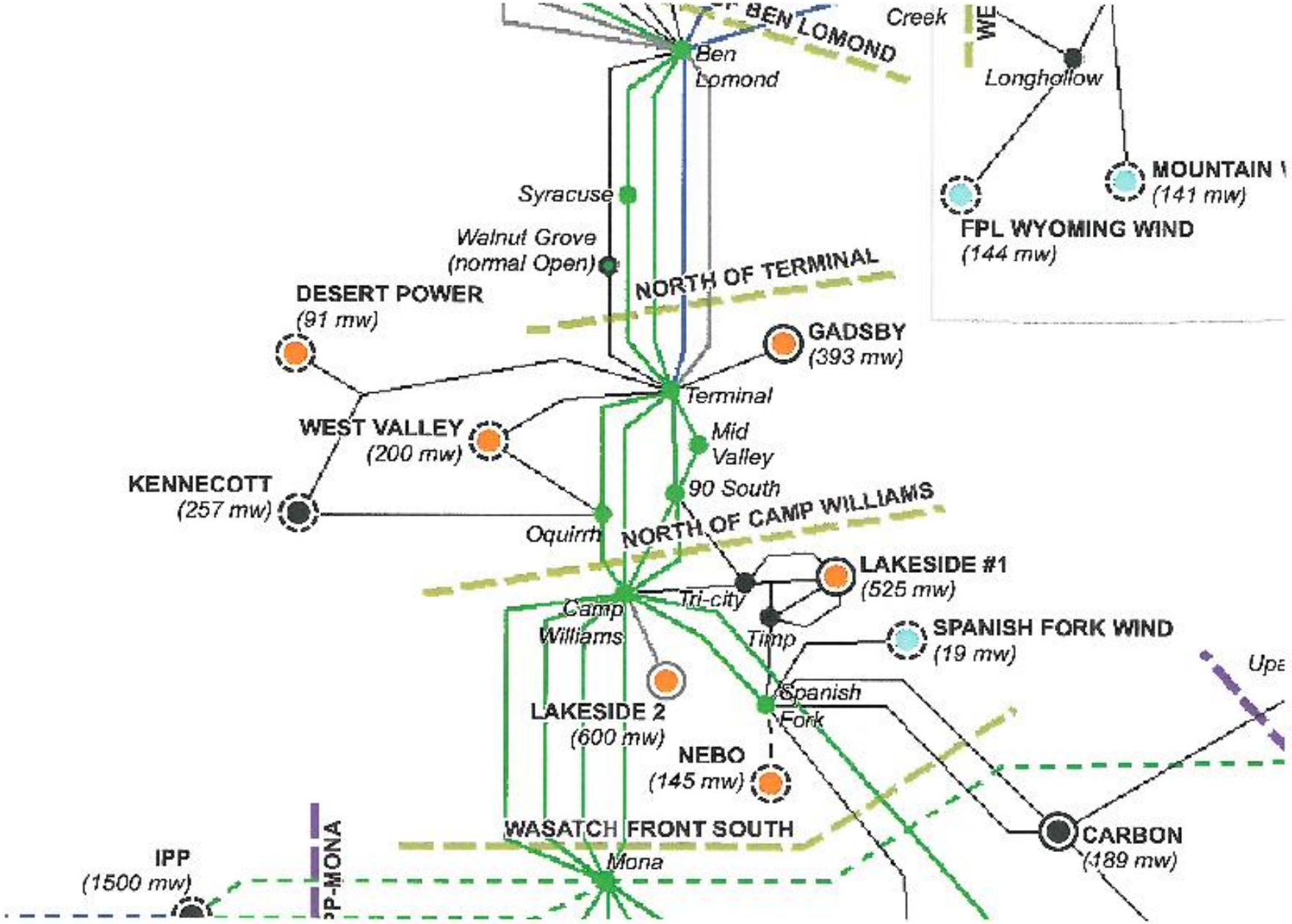
http://www.oasis.pacificorp.com/oasis/ppw/20110922_rfpattachment20_draft.doc

Salt Lake Valley

- Connect into the Wasatch Front load area.
- Connect to 138 kV or 345 kV south of Ben Lomond and north of Mona substations.

Salt Lake Valley – 138 kV

- $108 Million
- 600 MW delivered into the Salt Lake load bubble
- Lines requiring upgrades not identified (underlying transmission system)
- Reconstruction and upgrades to multiple 138-kV lines
- Upgrades to multiple 138-kV substations
- Location of resource interconnection will determine infrastructure needs


BEN LOMOND
Creek
Ben Lomond
Longhollow
MOUNTAIN
(141 mw)
FPL WYOMING WIND
(144 mw)
Syracuse
Walnut Grove
(normal Open)
NORTH OF TERMINAL
DESERT POWER
(91 mw)
GADSBY
(393 mw)
Terminal
WEST VALLEY
(200 mw)
Mid Valley
90 South
KENNECOTT
(257 mw)
Oquirrh
NORTH OF CAMP WILLIAMS
LAKESIDE #1
(525 mw)
Tri-city
Camp Williams
Timp
SPANISH FORK WIND
(19 mw)
Spanish Fork
LAKESIDE 2
(600 mw)
NEBO
(145 mw)
WASATCH FRONT SOUTH
CARBON
(189 mw)
Mona
IPP
(1500 mw)
P-MONA

Mona - Currant Creek

- $67 Million
- 600 MW delivered into the Salt Lake load bubble
- New ≈ 0.6 mile 345-kV Currant Creek to Mona line
- Additions at Mona and Currant Creek substations to accommodate termination and operation of the new line
- Energy Gateway projects as noted below:
  - New Clover (Mona) to Oquirrh line and substation upgrades currently scheduled for completion spring of 2013 (new line proposed for load service and excluded from costs)

Glen Canyon

- $382 Million
- 600 MW delivered into the Salt Lake load bubble
- New ≈160 mile 345-kV Glen Canyon to Sigurd line (existing line is fully subscribed to firm contracts)
  - Significant permitting issues expected
- Phase shifting transformer location to be determined
- Network improvements north of Sigurd/Huntington
- Additions at Glen Canyon, and Sigurd substations to accommodate termination and operation of the new lines
- Energy Gateway projects as noted below:
  - New Clover (Mona) to Oquirrh line and substation upgrades (new line proposed for load service and excluded from costs)

Gonder

- $336 Million
- 600 MW delivered into the Salt Lake load bubble
- New ≈ 190 mile 345-kV Gonder NV to Mona line
- Additions at Gonder and Mona for the termination and operation of the new line
- Network improvements north of Huntington/Sigurd
- Energy Gateway projects as noted below:
  - New Clover (Mona) to Oquirrh line and substation upgrades (new line proposed for load service and excluded from costs)

Harry Allen

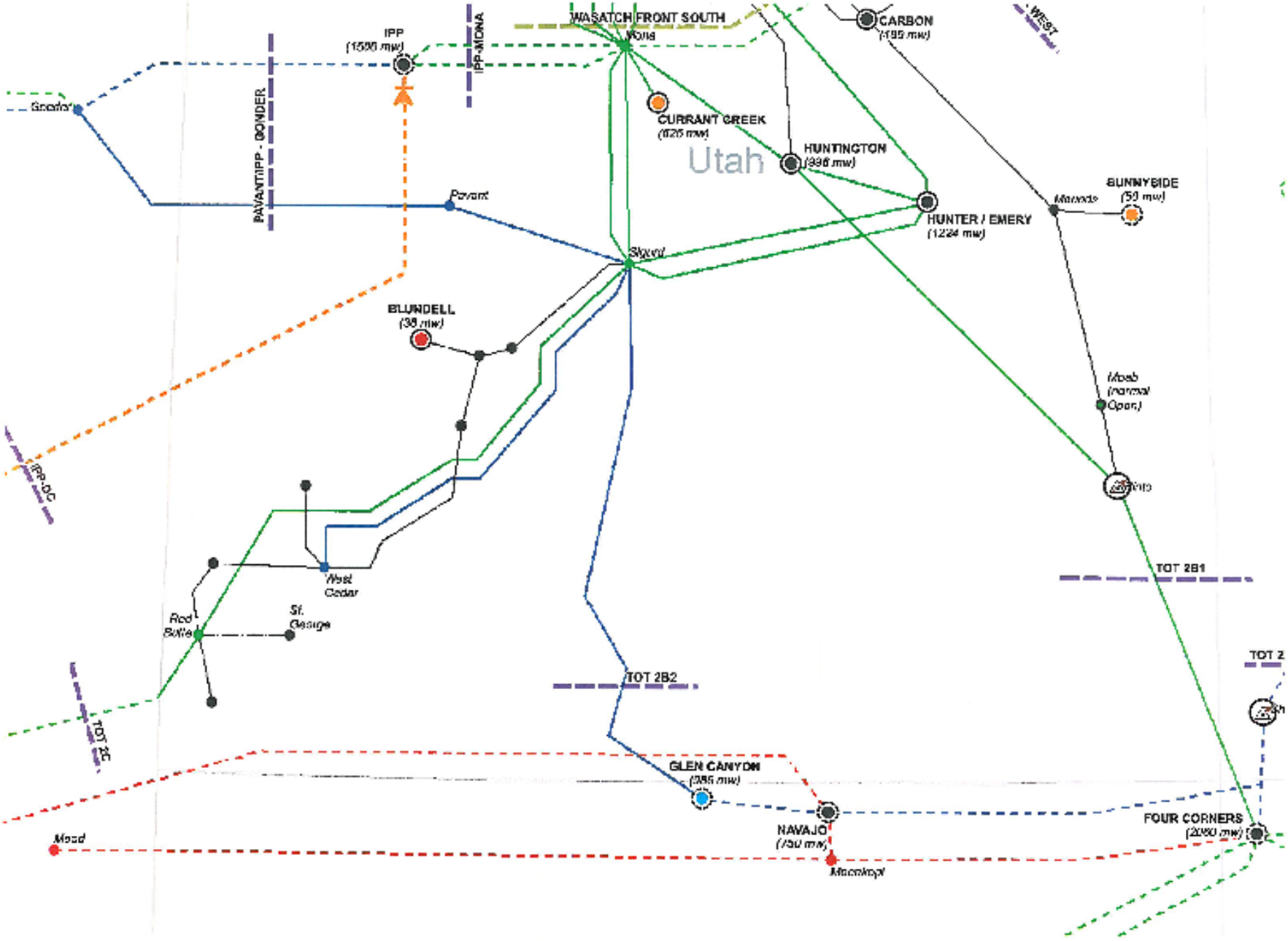
- $76 Million
- 449 MW Summer/524 MW Winter delivered into the Salt Lake load bubble
- Network improvements north of Huntington/Sigurd
- Energy Gateway projects as noted below:
  - New Clover (Mona) to Oquirrh line and substation upgrades (new line is proposed for load service and excluded from costs)

Crystal

- $549 Million
- 600 MW delivered into the Salt Lake load bubble
- New ≈ 120 mile Crystal to Red Butte 345-kV transmission line
- Additions at Crystal and Red Butte substations for the termination and operation of the new lines
- Network improvements north of Huntington/Sigurd
- Includes a phase shifting and transformation at Crystal
- Energy Gateway projects as noted below:
  - A second 345-kV Sigurd to Red Butte transmission line (new line is proposed for load service and excluded from costs)
  - New Clover (Mona) to Oquirrh line and substation upgrades (new line is proposed for load service and excluded from costs)

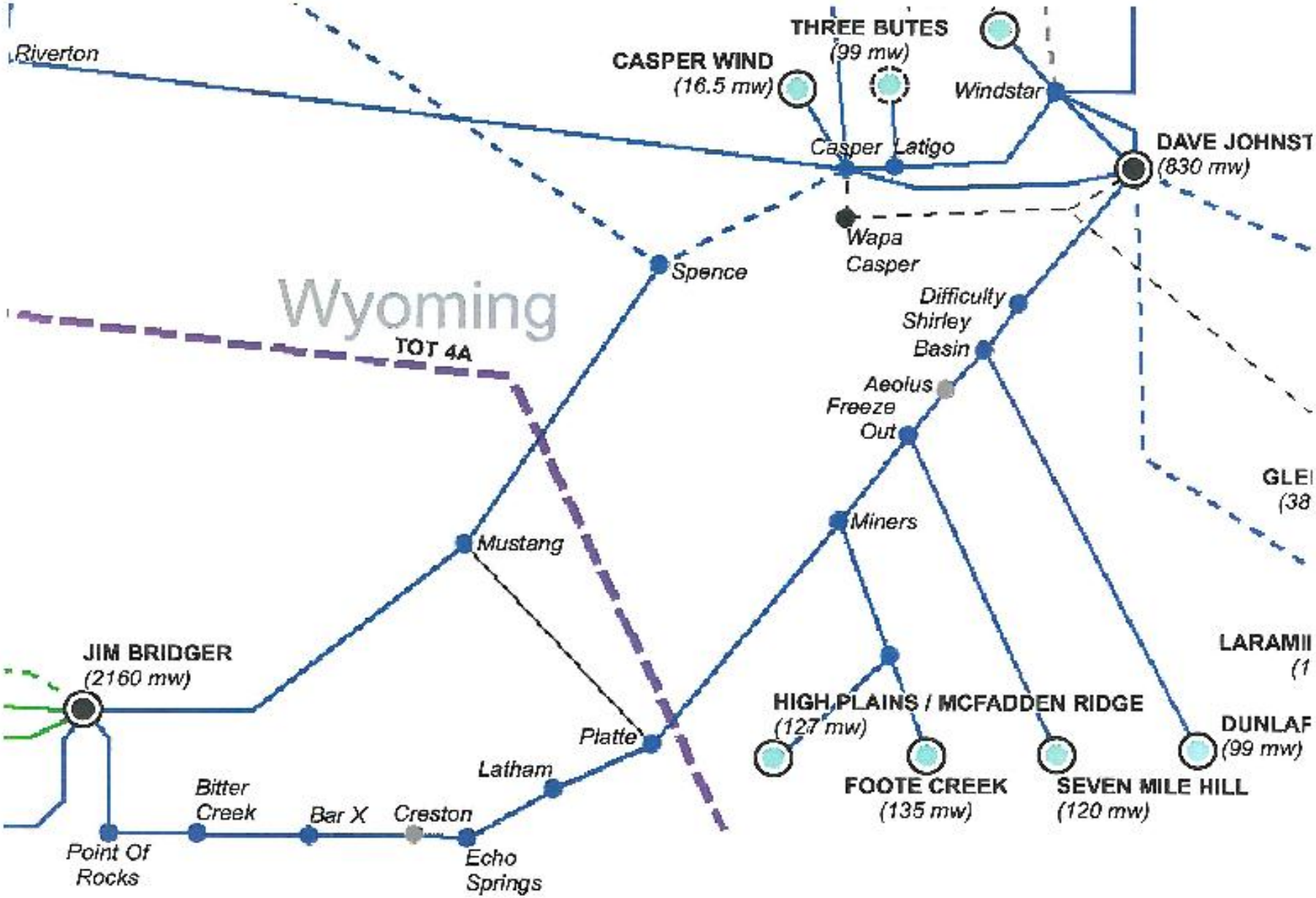
Four Corners

- $798 Million
- 600 MW delivered into the Salt Lake load bubble
- Network improvements north of Huntington/Sigurd
- New ≈ 255 mile 345-kV Four Corners to Emery transmission line
  - Existing line is fully subscribed to firm contracts
  - Significant permitting issues expected
- Energy Gateway projects as noted below:
  - New Clover (Mona) to Oquirrh line and substation upgrades (new line is proposed for load service and excluded from costs)


WASATCH FRONT SOUTH
Mona
IPP
(1500 mw)
IPP-MONA
CARBON
(195 mw)
WEST
Goshen
PAVANTIPP - GONDER
CURRANT CREEK
(625 mw)
Utah
HUNTINGTON
(996 mw)
Pavant
HUNTER / EMERY
(1224 mw)
Manoa
SUNNYSIDE
(59 mw)
Sigurd
BLUNDELL
(38 mw)
Moab
(normal
Open)
IPP-DC
TOT 2B1
West
Cedar
Red
Butte
St.
George
TOT 2B2
TOT 2
TOT 2C
GLEN CANYON
(335 mw)
NAVAJO
(750 mw)
FOUR CORNERS
(2050 mw)
Mead
Moenkopi

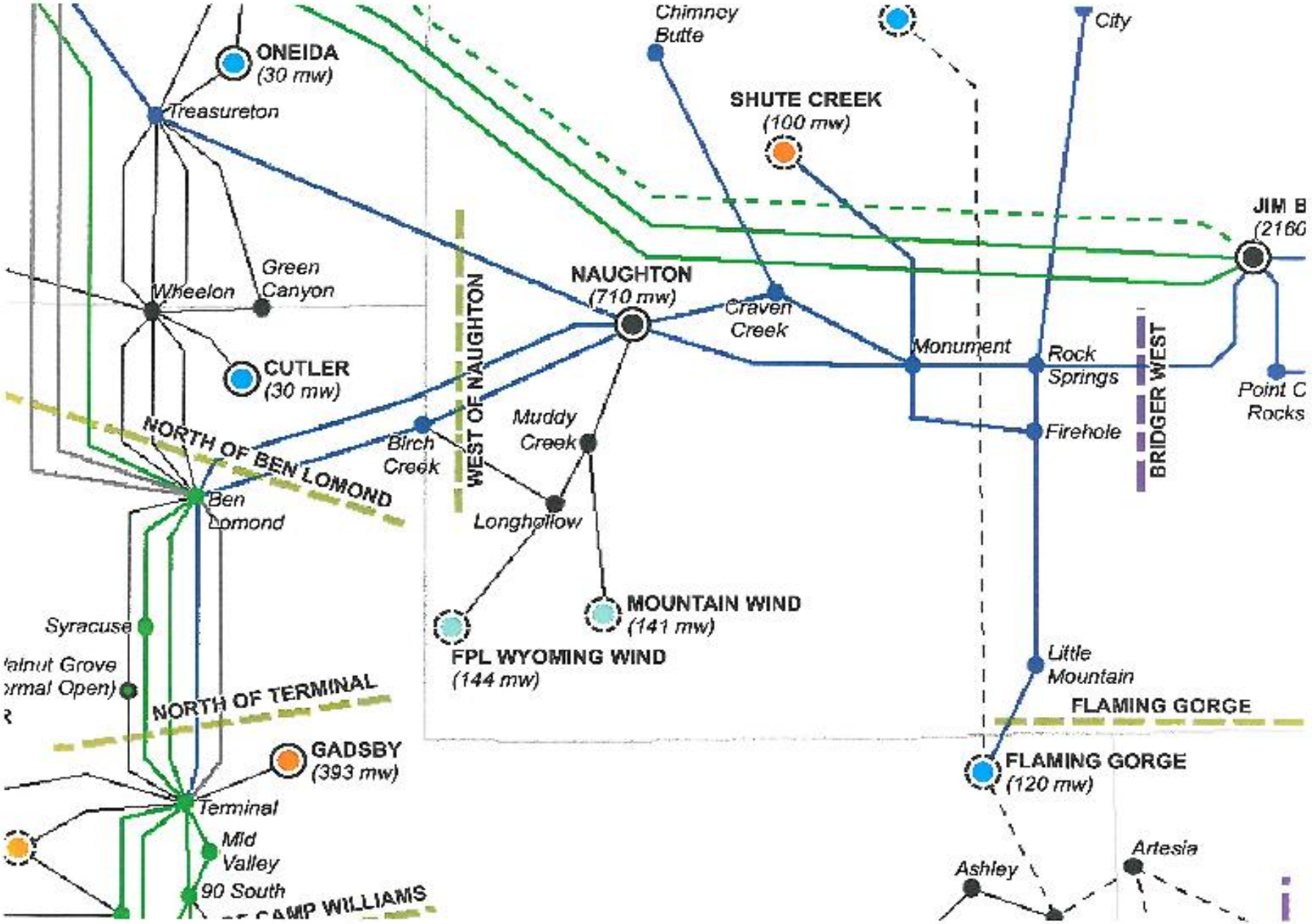
Eastern Wyoming

- $20-$175 Million
- Substation upgrades
- Cost varies dependent on resource location
- 400 MW delivered to the Energy Gateway project at the new Windstar, Aelolus, or Anticline substations
- Energy Gateway projects as noted below
  - Requires new Energy Gateway West or South infrastructure current schedule is 2015 to 2019 (new line is proposed for load service and excluded from costs)


Riverton
THREE BUTES
(99 mw)
CASPER WIND
(16.5 mw)
Windstar
Casper
Latigo
DAVE JOHNST
(830 mw)
Wapa
Casper
Spence
Wyoming
TOT 4A
Difficulty
Shirley
Basin
Aeolus
Freeze
Out
GLE
(38
Miners
Mustang
LARAMI
(1
JIM BRIDGER
(2160 mw)
HIGH PLAINS / MCFADDEN RIDGE
(127 mw)
DUNLAF
(99 mw)
Platte
Latham
Bitter
Creek
Bar X
Creston
FOOTE CREEK
(135 mw)
SEVEN MILE HILL
(120 mw)
Point Of
Rocks
Echo
Springs

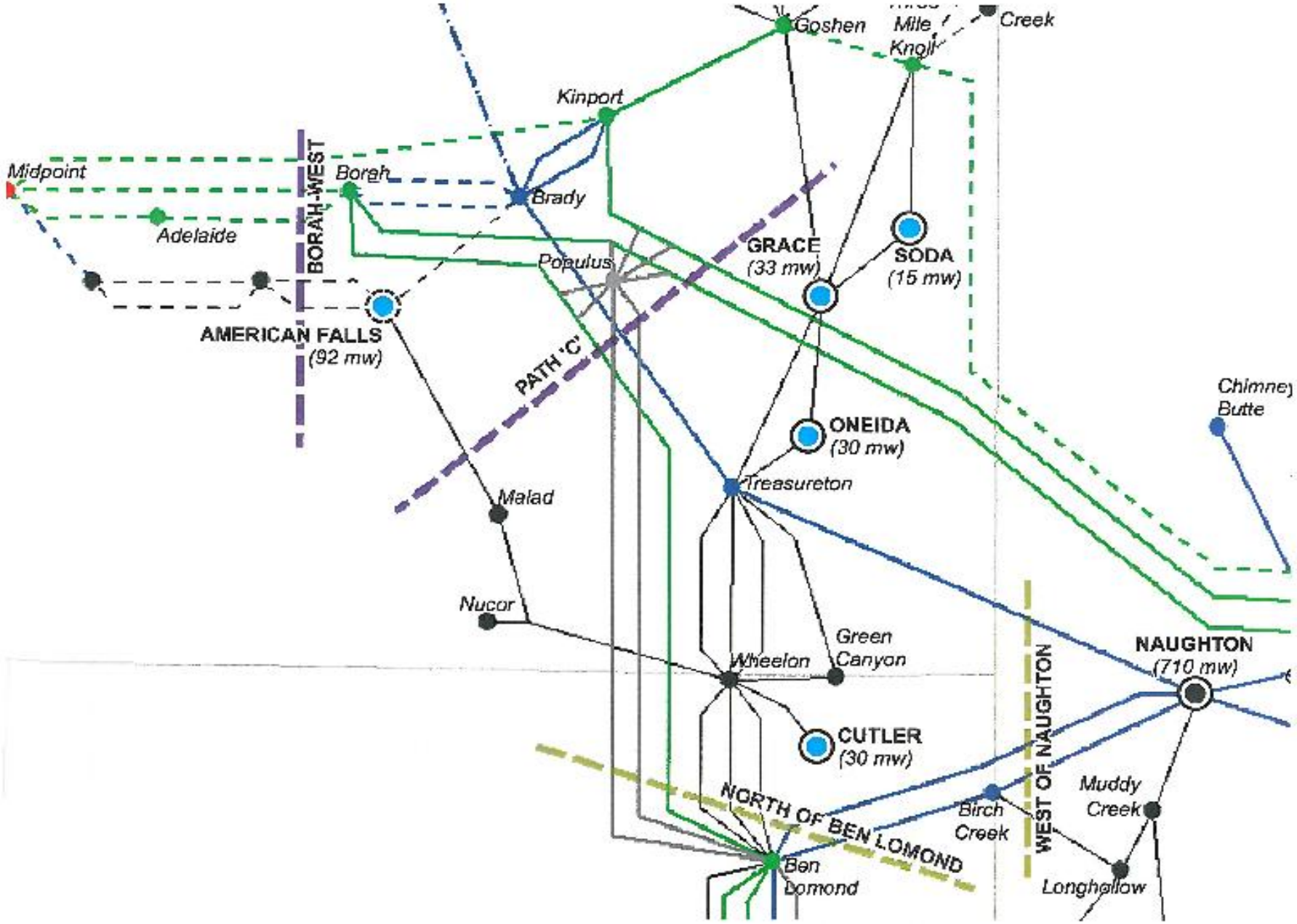
Southwestern Wyoming

- $70 Million
- New transmission line Southwest Wyoming to northern Utah
- Substation upgrades at interconnection point


ONEIDA
(30 mw)
Treasureton
Wheelon
Green Canyon
CUTLER
(30 mw)
NORTH OF BEN LOMOND
Ben Lomond
Syracuse
Walnut Grove
(Normal Open)
NORTH OF TERMINAL
GADSBY
(393 mw)
Terminal
Mid Valley
90 South
CAMP WILLIAMS
Chimney Butte
SHUTE CREEK
(100 mw)
City
JIM B
(2160
NAUGHTON
(710 mw)
WEST OF NAUGHTON
Birch Creek
Muddy Creek
Longhollow
Craven Creek
Monument
Rock Springs
Firehole
BRIDGER WEST
Point C
Rocks
MOUNTAIN WIND
(141 mw)
FPL WYOMING WIND
(144 mw)
Little Mountain
FLAMING GORGE
FLAMING GORGE
(120 mw)
Ashley
Artesia

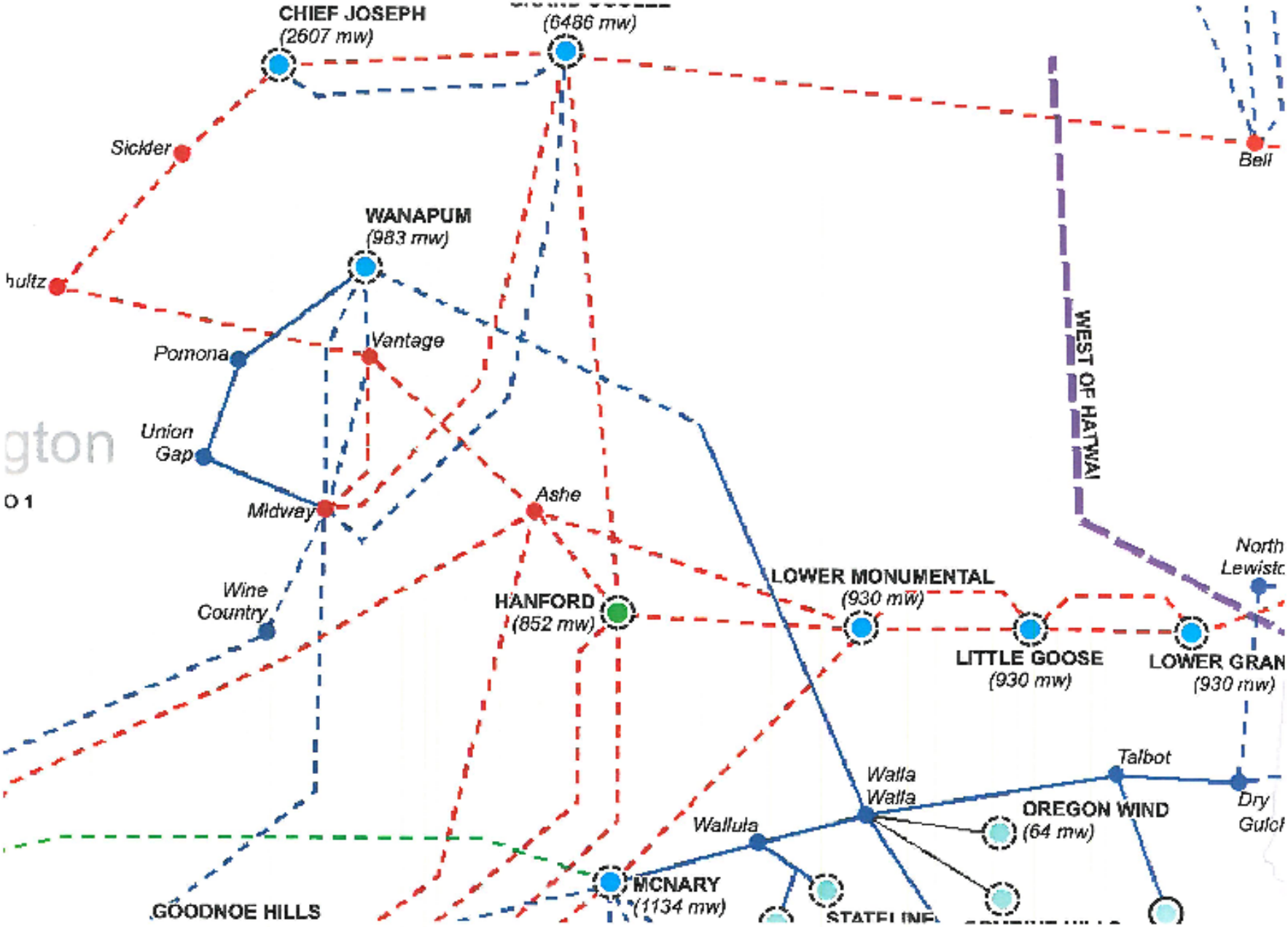
Borah, Kinport or Populus

- $10 M
- Resources located off system must include firm transmission rights through any third party transmission provider (connected to Borah or Kinport)
- Additions at substations for the interconnection of the new resource
- Delivery requires use of existing firm allocation across Path C


Goshen
Mile
Knoll
Creek
Kinport
Midpoint
Boreh
Brady
BORAH-WEST
Adelaide
Populus
GRACE
(33 mw)
SODA
(15 mw)
AMERICAN FALLS
(92 mw)
PATH 'C'
Chimney
Butte
ONEIDA
(30 mw)
Treasureton
Malad
Nucor
Green
Canyon
Wheelon
NAUGHTON
(710 mw)
CUTLER
(30 mw)
WEST OF NAUGHTON
NORTH OF BEN LOMOND
Muddy
Creek
Birch
Creek
Ben
Lomond
Longhollow

Mid Columbia – Wanapum or Vantage

- $10 M
- Additions at Wanapum or Vantage substations for the interconnection of the new resource
- 600 MW delivered to PacifiCorp load
- Resources located off system must include firm transmission rights through any third party transmission provider
- Completion of new ≈ 60 mile 230-kV Vantage to Pomona Heights transmission line
  - In-service date is currently 2013 (new line is proposed for reliability and excluded from costs)


CHIEF JOSEPH
(2607 mw)
(6486 mw)
Sickler
Bell
WANAPUM
(983 mw)
hultz
Pomona
Vantage
WEST OF HATWAI
Union
Gap
Midway
Ashe
North
Lewistc
Wine
Country
HANFORD
(852 mw)
LOWER MONUMENTAL
(930 mw)
LITTLE GOOSE
(930 mw)
LOWER GRAN
(930 mw)
Talbot
Walla
Walla
Dry
Gulch
OREGON WIND
(64 mw)
Wallula
MCNARY
(1134 mw)
GOODNOE HILLS

Portland – Troutdale

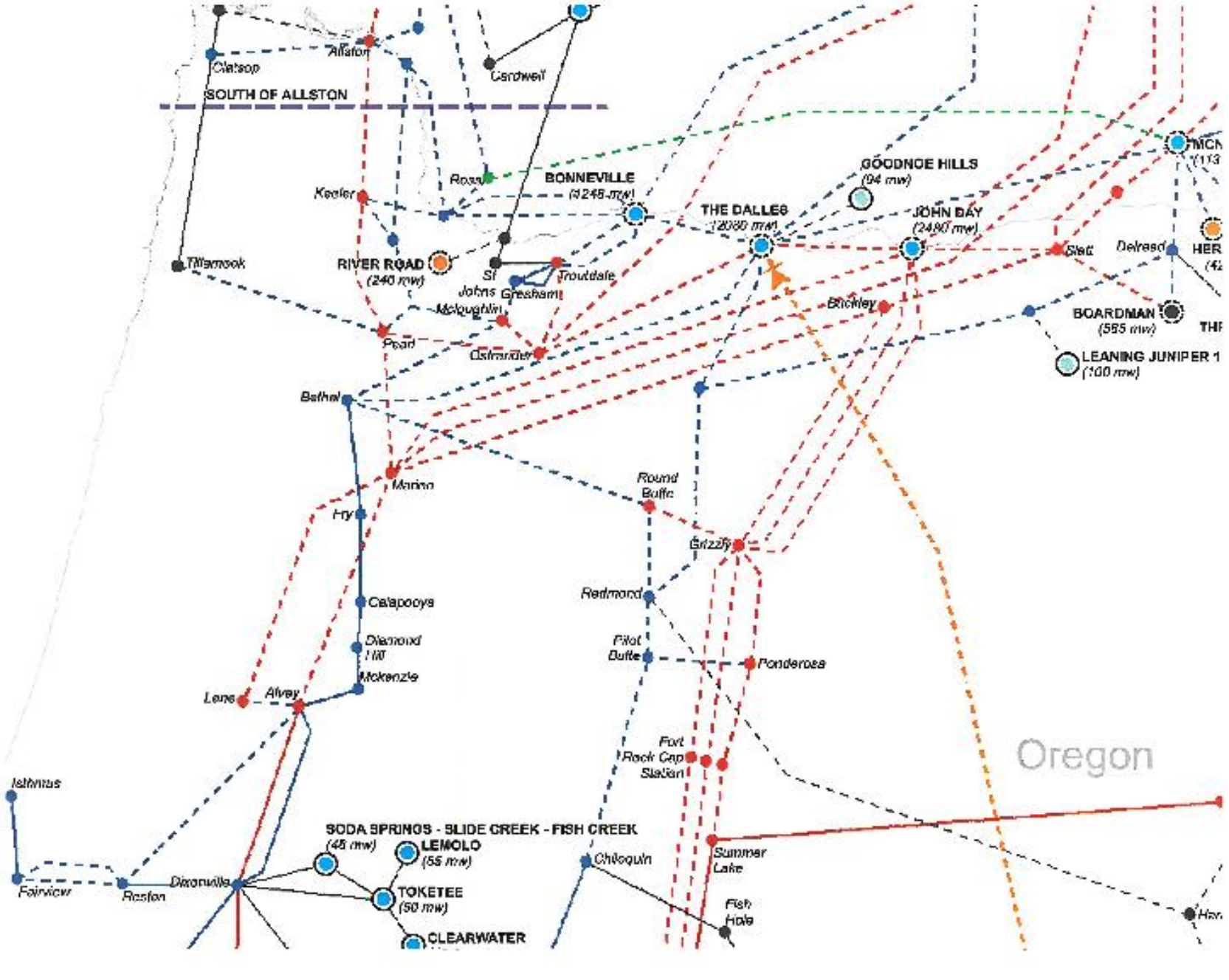
- $260 Million
- 400 MW delivered to the Portland load bubble
- New ≈ 55 mile 230 kV Troutdale to Bethel transmission line
- New ≈ 30 mile 230 kV Bethel to Fry transmission line
- Additions at Troutdale, Bethel, and Fry substations for the termination and operation of the new lines

Willamette Valley

- $220 Million
- 400 MW delivered to Willamette Valley load bubble
- Resource interconnected south of Alvey and north of Dixonville
- New ≈ 60 mile 230-kV Dixonville to Alvey transmission line
- Additions at Dixonville and Alvey substations for the termination and operation of the new line
- New 230 kV substation to interconnect resource

Alvey Substation

- $10 M
- 400 MW delivered to Willamette Valley load bubble
- Cost for interconnection infrastructure at Alvey substation


Clatsop
Allston
Cardwell
SOUTH OF ALLSTON
Keeler
Ross
BONNEVILLE
(1245 mw)
GOODNOE HILLS
(94 mw)
THE DALLES
(2080 mw)
JOHN DAY
(2480 mw)
Tillamook
RIVER ROAD
(240 mw)
St Johns
Troutdale
Gresham
McLoughlin
Pearl
Ostrander
Bethel
Marion
Fry
Calapooya
Diamond Hill
Mckenzie
Lane
Alvey
Round Butte
Grizzly
Redmond
Pilot Butte
Ponderosa
Fort Rock Cap
Station
Oregon
Isthmus
Fairview
Reston
Dixonville
SODA SPRINGS - SLIDE CREEK - FISH CREEK
(45 mw)
LEMOLO
(55 mw)
TOKETEE
(50 mw)
CLEARWATER
Chiloquin
Summer Lake
Fish Hole
Bickley
BOARDMAN
(585 mw)
LEANING JUNIPER 1
(100 mw)
Delrest

California - Oregon Border

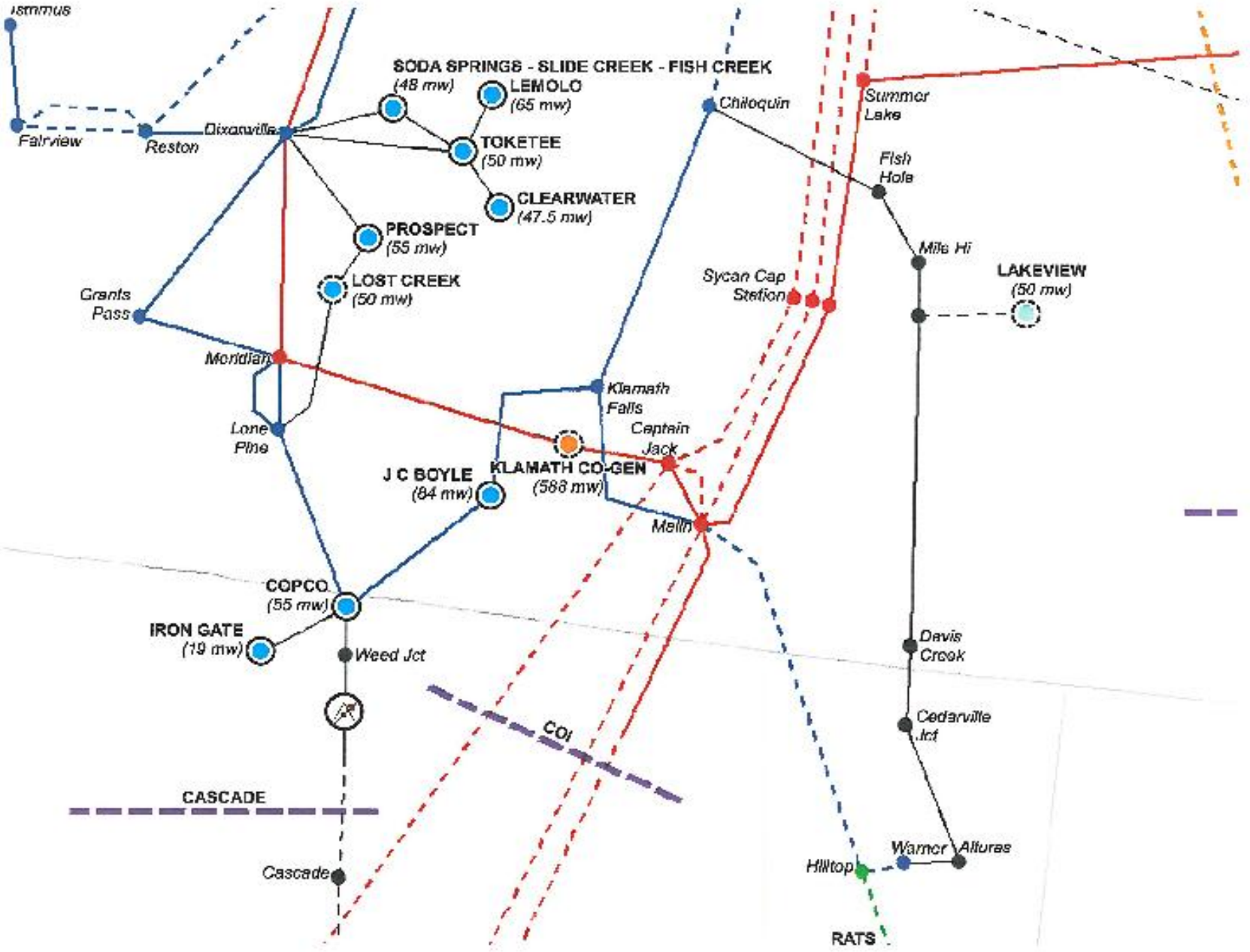
- $314 Million
- 600 MW delivered to Southern Oregon load bubble
  - Some incremental capacity required to existing COI rights
- New ≈ 60 mile 230-kV Dixonville to Alvey transmission line
  - Existing line is fully subscribed to firm contracts
- Additions at Dixonville and Alvey substations for the termination and operation of the new line
- New 500/230 substation connected to the 500 kV system
- Additional studies required to determine need for a new Alvey to Fry line

Chiloquin Southern Oregon

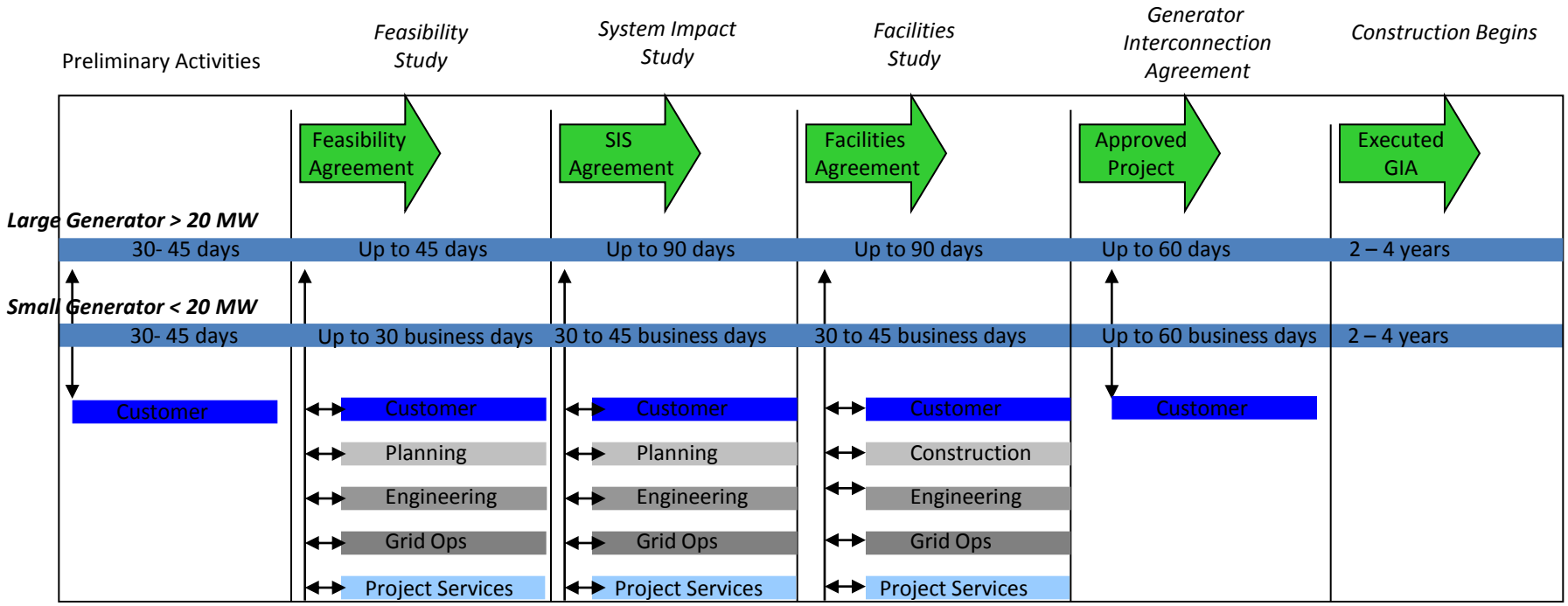
- $100 Million
- Delivery of 400 MW into the southern Oregon load bubble
- New 30 mile 230-kV Chiloquin to Klamath Falls transmission line
- Additions at the Chiloquin and Klamath Falls substations for the termination and operation of the new line
- Additional studies required to determine if a new 500/230 kV substation required

Southern Oregon 600 MW

- $55 M
- New resource interconnected west of Klamath Falls and east of Grant Pass
- New 500/230 kV substation connected to existing 500 kV system


Ismmus
Fairview
Reston
Dixonville
SODA SPRINGS - SLIDE CREEK - FISH CREEK
(48 mw)
LEMOLO
(65 mw)
TOKETEE
(50 mw)
CLEARWATER
(47.5 mw)
PROSPECT
(55 mw)
LOST CREEK
(50 mw)
Grants
Pass
Meridian
Lone
Pine
Chiloquin
Summer
Lake
Fish
Hole
Mile Hi
LAKEVIEW
(50 mw)
Sycan Cap
Stefion
Klamath
Falls
Captain
Jack
J C BOYLE
(84 mw)
KLAMATH CO-GEN
(586 mw)
Mellin
COPCO
(55 mw)
IRON GATE
(19 mw)
Weed Jct
COI
CASCADE
Cascade
Davis
Creek
Cedarville
Jct
Warner
Alturas
Hilltop
RATS

Typical Interconnection Study Timeline



45-day Feasibility Study - includes:

- Circuit breaker short circuit capability limits exceeded
- Thermal overload or voltage limit violations
- Description and cost estimate of facilities required
- If network resource, a description and cost estimate of transmission modifications required to deliver generation to network load

90-day System Impact Study - includes:

- Short circuit analysis
- Stability analysis
- Power flow analysis
- Estimate of the cost responsibility
- Estimated time to construct

LGIA Network Resource/Energy Resource

- Generators don't need a network resource interconnection for PacifiCorp Merchant to designate them as a network resource in the transmission service queue
- If generators do insist on a network resource interconnection agreement, the interconnection procedures require them to fund all transmission upgrades necessary to deliver the power to load, funding subject to refunds

LGIA Customer Data Requirements

- Application
  - Complete application
  - Site control
  - Deposit
- Feasibility Study
  - One-line diagram
  - Step-up transformer data
  - Radial interconnecting line data

Data Requirements, *continued*

System Impact Study:

- Non-wind:
  - Generator data
  - Excitation system block diagram
  - Power system stabilizer block diagram/data
  - Governor system block diagram/data
- Wind:
  - One-line diagram showing layout of wind farm and impedances for all segments
  - Wind turbine model
  - Size and increments of supplemental reactive compensation