



# Q113 Generation Interconnection

## **Interconnection Facilities Study**

APS Contract No. 52440

**By**

**Arizona Public Service Company  
Transmission Planning**

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Version 1.2

# FACILITIES STUDY Q113 PROPOSED GENERATION

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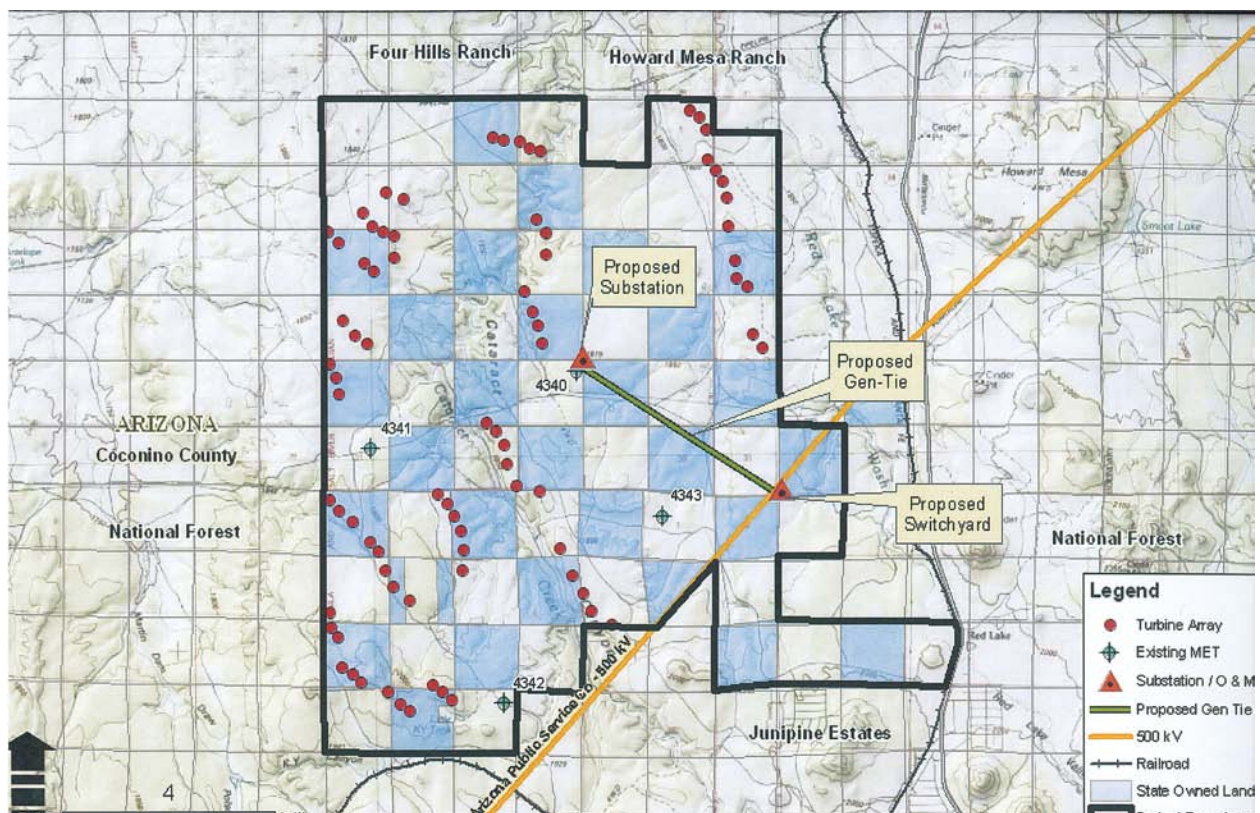
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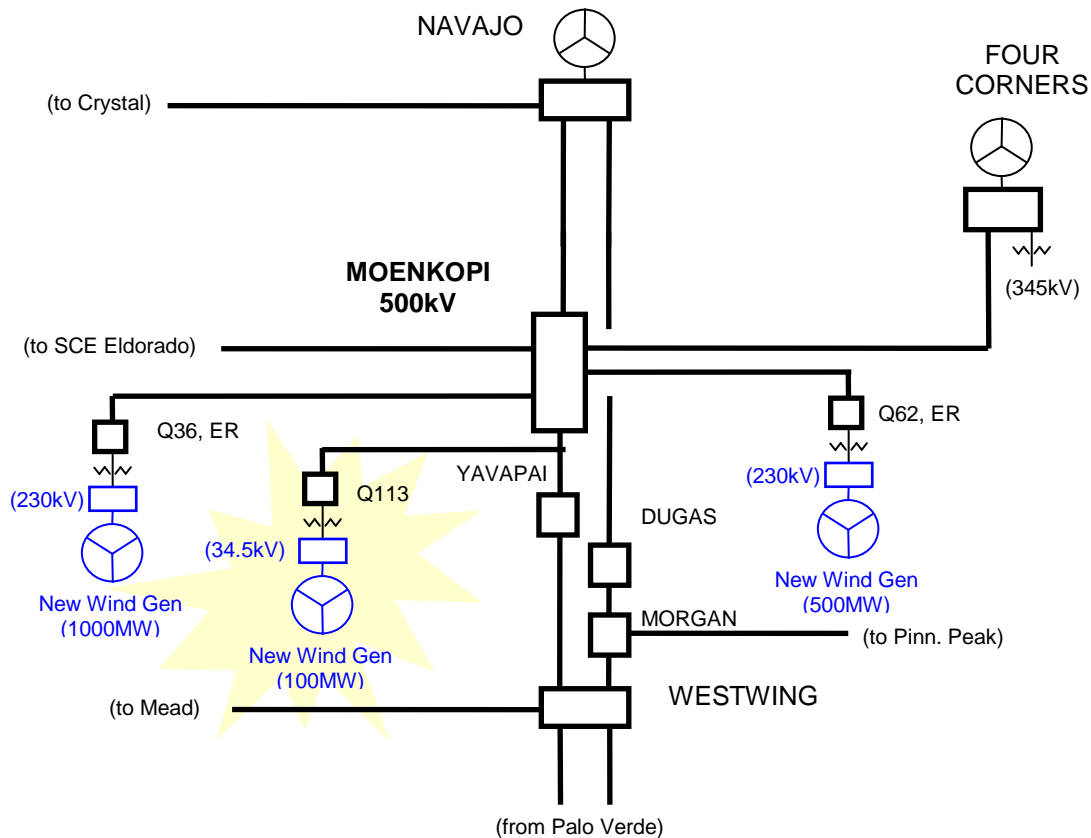
# 1. Introduction

APS performed this Generator Interconnection Facilities Study (“FaS”) in response to a generator interconnection request by the Interconnection Customer (“Customer”). The Customer is listed in APS’s Active Generator Interconnection Queue as queue number 113 and has already completed a System Impact Study. The purpose of the study is to provide cost and construction schedule estimates for the facilities needed to interconnect the Customer’s proposed 100 MW wind generation facility (“Q113”) located approximately 10 miles north of Williams, Arizona in Coconino County. The Point of Interconnection (“POI”) assumed for the FaS is the proposed new Cedar Mountain 500kV switchyard in the Moenkopi-Yavapai 500kV line. The proposed in-service date for Q113 is the end of 2011. **Figure 1** shows a general location of Q113. **Figure 2** shows a general depiction of the EHV system around Q113’s proposed POI.

Figure 1. Project Location



**Figure 2. Transmission System in the Q113 vicinity**



The Interconnection Customer has chosen a Network Resource Interconnection. Delivery of the Q113 output beyond the POI has been arranged by the purchasing company of the Q113 resources, using a part of APS's transmission capacity.

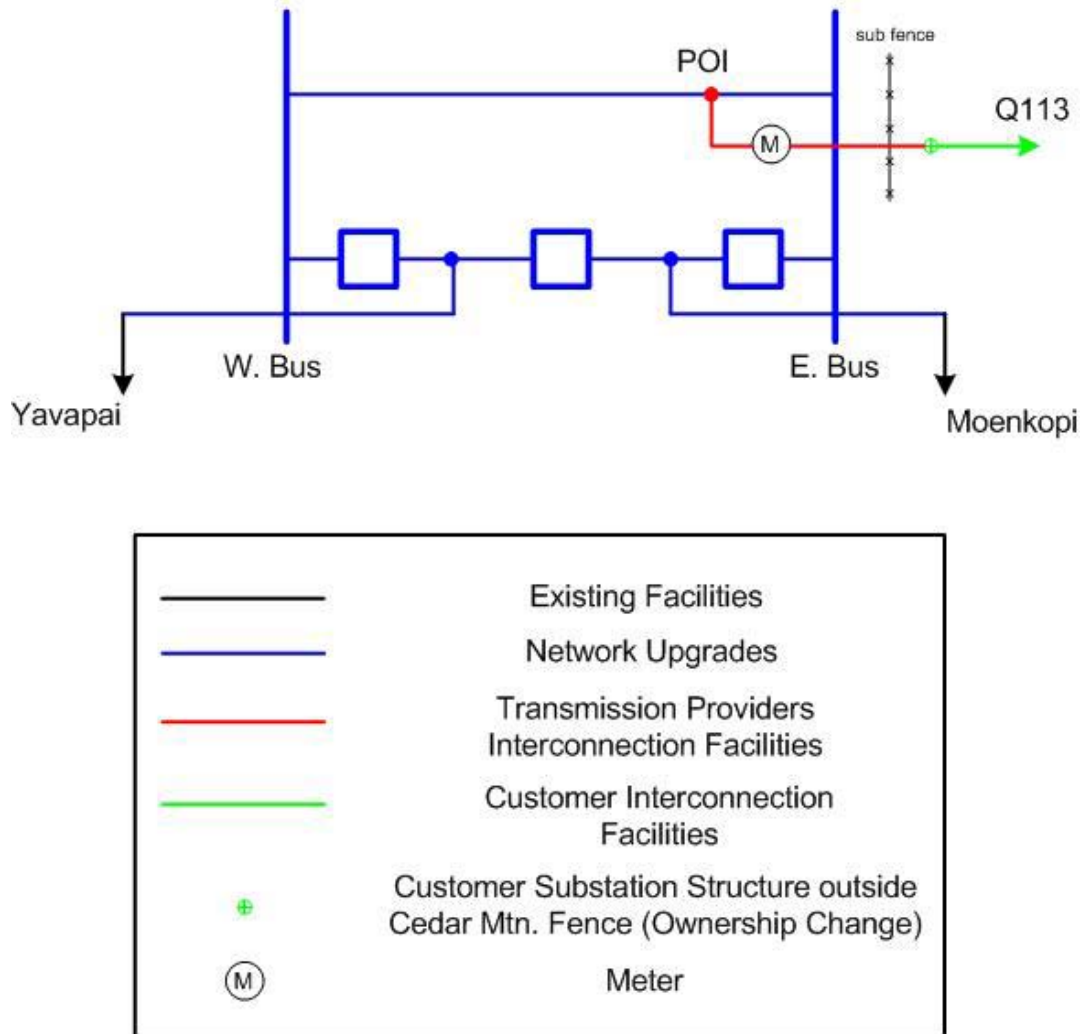
## 2. Interconnection Facilities – Cedar Mountain 500kV Switchyard

The interconnection facilities required for the Q113 project consist of a new 500kV switchyard, approximately 50 miles south of Moenkopi along the Moenkopi-Yavapai 500kV line, and an in-and-out of the existing Moenkopi-Yavapai 500kV line at the new Cedar Mountain switchyard location. The Moenkopi-Yavapai line does have a series capacitor bank at the Moenkopi end, but the interconnection of the line with the new Cedar Mountain switchyard will not require any changes to the series compensation. The Cedar Mountain switchyard interconnection facilities are depicted in a simple one-line diagram in **Figure 3**. The Cedar Mountain 500kV switchyard will be configured for an ultimate breaker-and-a-half layout, but set-up for only four terminations. It will initially be set up as a three breaker ring, as depicted in **Figure 3**.

In addition to the new switchyard, new communications will need to be installed. The plan is to have an interim communications system and then a permanent system. The permanent system will take several years to install so the interim system was designed to facilitate the Q113 project to go commercial. Relay replacements will also be required at Moenkopi and Yavapai. Station service needs and retail service needs of the Customer will require distribution voltage facility additions. This new distribution line can also be used to support the fiber optic cable needed for part of the interim communication system. A special

protection scheme will be required to ensure the transmission system reliability for multiple contingency situations.

**Figure 3. New Cedar Mountain Switchyard – Simplified one-line for initial build-out Cedar Mtn. 500kv**



APS is the Operating Agent of the Moenkopi-Yavapai 500kV line, therefore the proposed Cedar Mountain switchyard will also be operated and maintained by APS. The switchyard will be owned by the same parties that own the Moenkopi-Yavapai 500kV line and in the same percentages (APS:24.7%, SRP:38.3%, TEP:13.3%, & USBR/WAPA:23.7%).

### 3. Cost Estimates

The estimated costs of the Q113 interconnection are allocated into several categories, Network Upgrades, Interim Communications, Transmission Provider's Interconnection Facilities, and Distribution

Facilities. These costs are summarized in **Table 1** below. Most of the costs described in **Table 1** are associated with the new Cedar Mountain switchyard which is depicted in **Figure 3**.

**Table 1. Cost Estimates-Q113 Interconnection**

<b>NETWORK UPGRADES</b>		
<b>Project</b>		<b>TOTAL</b>
Cedar Mountain Switchyard	New 500kV switchyard on 10 acres, 3 breakers, control enclosure, Microwave tower	\$7,476,323.00
500kV Line Cut In	Four Double Dead end structures, lattice tower, bundled conductors. 10 line deadends	\$3,425,066.00
Moenkopi Relaying		\$239,928.00
Yavapai Relaying		\$239,928.00
Communication Permanent		
Q113 Switchyard	Microwave tower, enclosure, radios, security	
Bill Williams	Dish, Radio	
Fiber to Yavapai	50 miles, Multiplex	
		\$6,374,751.00
<b>Total Network Upgrades</b>		<b>\$17,755,996.00</b>
<b>Interim Communications</b>		
Red Lake Sub Communications		\$299,712.00
Fiber on 21Kv Line to Red Lake	Cost of installing fiber (3 miles)	\$83,527.00
Communications (Interim)		
Cedar Mountain	Fiber, associated hardware	
Bill Williams Mountain	Dish, radio	
		\$72,811.00
<b>TOTAL(Interim Comm)</b>		<b>\$456,050.00</b>

<b>Transmission Provider Interconnection Facilities (TPIF)</b>		
Facilities at Cedar Mountain	(2) A-Frames, (3) CCVT's, (1) Switch	\$685,958.00
<b>TOTAL (TPIF)</b>		<b>\$685,958.00</b>
<b>Distribution Upgrades</b>		
21kV line Red Lake-Cedar Mtn.(w/o fiber)	3 miles, 62 poles, 2R, 3-phase.	\$1,128,267.00
Red lake Substation Upgrades	upgraded transformer, New feeder bay, recloser	\$572,227.00
<b>Total Distribution Upgrades</b>		<b>\$1,700,494.00</b>
<b>TOTAL PROJECT COSTS</b>		<b>\$20,598,498.00</b>

It will be the responsibility of the Customer to work with each of the transmission owners individually to determine the specifics of how, if, when and under what circumstances the allocated share of the Network Upgrades will be repaid. This will be in accord with each individual transmission owner's Tariff. The costs associated with the Interim Communications, Transmission Provider's Interconnection Facilities and the Distribution Upgrades will not be entitled to any cost recapture from the transmission owners by the Customer.

An Engineering and Procurement agreement has been signed by APS, as operating agent for the transmission owners, and the Customer. A significant part of the cost of the project is expected to be paid for by way of this agreement. It is believed that once the LGIA is signed and filed with FERC, project funding will then be handled through the LGIA. The expected cash flow for the project is shown in **Table 2**.

**Table 2. Estimated Cash Flow**

<b>Time period</b>	<b>\$</b>
January-June 2011 via E&P agreement	2,000,000
July 2011	1,000,000
August 2011	3,000,000
September 2011	2,000,000
October 2011	2,000,000
November 2011	2,000,000

December 2011	2,000,000
January 2012	474,311
April 2012	100,000
July 2012	50,000
October 2012	50,000
January 2013	50,000
April 2013	50,000
July 2013	700,000
October 2013	1,250,000
January 2014	1,250,000
April 2014	1,250,000
October 2014	1,374,187
<b>Total</b>	<b>20,598,498</b>

#### 4. Construction Milestones

An Engineering and Procurement (E&P) agreement was signed on January 15, 2011 and a large amount of the engineering, design and material ordering has taken place. APS will continue working under the E&P agreement until the LGIA is signed and filed at FERC. Specific milestones accomplished under the E&P agreement are not included in the following table.

The desired in-service dates for the interconnection facilities are by December 31, 2011. **Table 3** has a list of Milestone dates for the construction schedule as estimated to achieve the desired in service date. This schedule is extremely aggressive with all activities needed to fall in line to achieve the desired in service date. Work through the E&P agreement for the first six months of 2011 have the project still on schedule.

**Table 3. Construction Milestones-Q113 Interconnection**

<b>Milestone</b>	<b>Responsible Party</b>	<b>Date</b>
<b>Engineering and Procurement Funded</b>	Interconnection Customer	1/14/11
<b>Begin Engineering Design and Material Procurement</b>	APS	5 Days after Funding
<b>LGIA Signed &amp; Filed at FERC, Large Generator Interconnect Agreement signed</b>	Interconnection Customer/APS	7/8/11



<b>LGIA Funded:</b> Large Generator Interconnect Agreement Submittal of Provision of Security ( <b>Agreement Section 13.5</b> )	Interconnection Customer	7/9/11
<b>Environmental Compliance:</b> Interconnection Customer complete all required Environmental and Archaeological Surveys and provide copy to APS.	Interconnection Customer	7/8/11
<b>Civil Construction:</b> Interconnection Customer begin site below grade construction of APS and IC interconnection substation ("site prep")	Interconnection Customer	7/9/11
<b>Site Acceptance of Civil Construction:</b> Interconnection Customer submit certified site as-built drawings of below grade construction and certified documents showing that site was built to APS Specifications	Interconnection Customer	5 days after completion of Civil Construction
<b>Land Transfer:</b> Interconnect Customer ensures land transfer and easements are complete	Interconnection Customer	5 days after Civil Construction is complete
<b>APS Substation Construction:</b> APS begin interconnection substation construction	APS	5 days after Site acceptance and Land Transfer and no later than 8/15/11
<b>Operating Letter:</b> APS and Interconnection Customer establish Project specific Operating Letter	Both Parties	5 days before Back Feed
<b>Outage Window:</b> APS outage for substation cut-in (Subject to change based on System Conditions) Begin line outage	APS	11/1/11
<b>Metering:</b> Metering installed, tested and released for use	Both Parties	Prior to Customer Energization
<b>In-Service/Back Feed:</b> APS substation cut-in complete and released to APS Operations for IC to obtain back feed power	APS	12/6/11
<b>Initial synchronization:</b> The date upon which the Generating Facility is initially synchronized and upon which Trial Operation begins.	Both Parties	12/27/11
<b>Commercial Operation:</b> Interconnection Customer Commercial Operation Date (C.O.D.)	Interconnection Customer	12/31/11

## 5. System Reinforcements

The Interconnection Customer has chosen to interconnect as an network resource, with the Q113 output sold to APS at the POI. Transmission service has been reserved on the APS portion of the southern Navajo transmission lines for this resource. After the power purchase agreement expires, the Interconnection Customer will need to work with the new purchaser to ensure transmission service is acquired from one or more of the owners of the transmission lines that interconnect to the interconnection switchyard. There are four participants who have an ownership interest in these transmission lines: APS, SRP, TEP, and USBR/WAPA. A request for transmission service may be made to any or all of the participants; subject to each participants OATT.