Power Sector Reform in Mexico

Introduction to Financial Transmission Rights Concepts in Mexico

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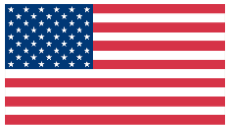

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Agenda

- FTR Background
- Characteristics of FTRs (Market Bases 13.1)
- Legacy Transmission Rights (Market Bases 13.2)
- Lunch
- Stage 1 FTR Auctions (Market Bases 13.3)
- Stage 2 FTR Auctions (Market Bases 13.3)
- Transmission & Distribution Upgrades (Market Bases 13.4)
- Closing Thoughts & International Perspectives

Disclaimer

- This presentation is based on available information:
  - Translation of the Market Bases dated September 12, 2015
  - Translations of some Draft Manuals
  - Supplemented by approaches for FTR Markets in the US
- Additional Details on the Auction schedules and software systems will be available in a FTR Manual in the future
- Participants, locations, prices, bids, etc. are illustrative only
- Calculations and data are simplified for illustrative purposes

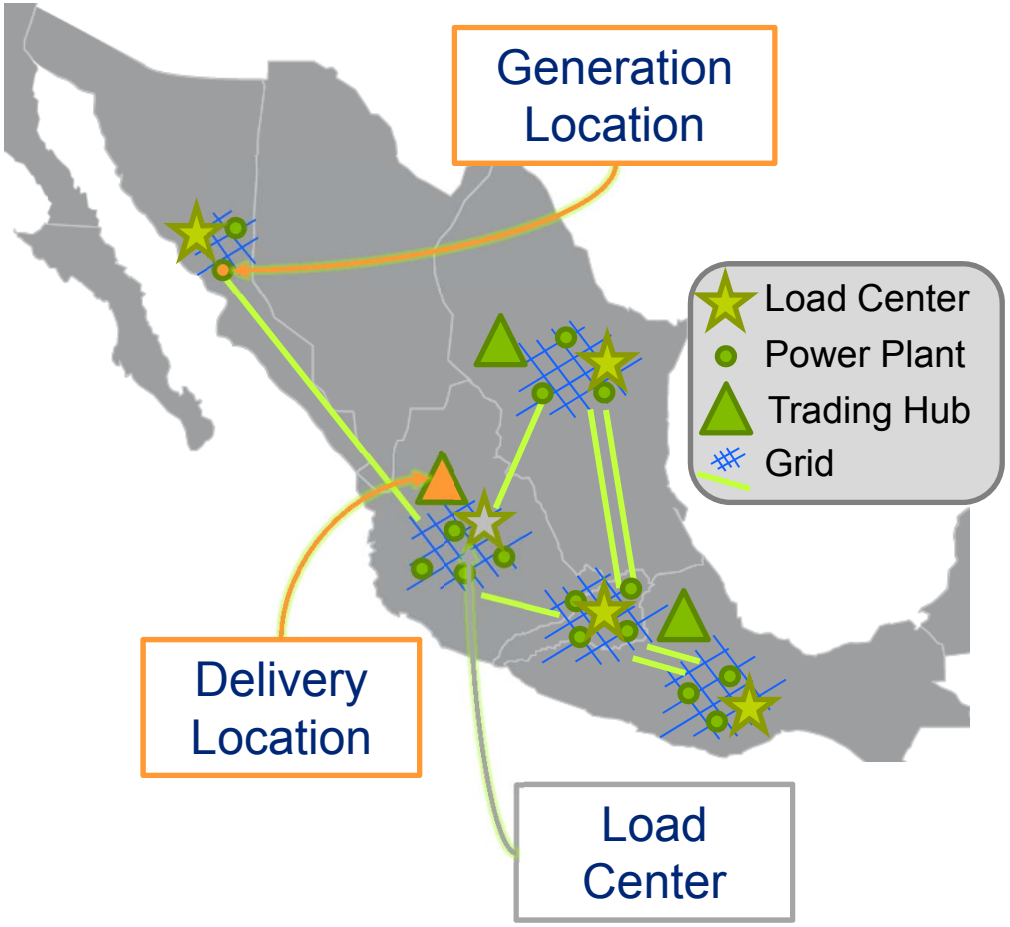
Bilateral Contracts in the Day-Ahead Market

- High-Level Example
- Day-Ahead Settlement
- Real-Time Settlement

Traditional Service: Example PPA

A Load Serving Entity has a contract with a Generator to provide physical supply

Seller	Rafael
Buyer	Anna
Generator Location	Gen Pnode E
Delivery Point	Trading Hub F
Term	2015 – 2025
Time of Day	04 to 20
PPA MWs	480
Contract Price	$500 / MWh



Results:

- Plant is Scheduled
- Physical Delivery
- Bilateral Settlement

Traditional Service: Example PPA Settlement

Settlement of Bilateral PPA

	Rafael			Anna		
Line	Price	MWs	Settle	Price	MW	Settle
PPA Bilateral Settlement	$500	480	$240,000	$500	(480)	($240,000)
Total	$500	480	$240,000	$500	(480)	($240,000)

Standard Day-Ahead Market Design

The Day-Ahead Market is:

- Financially Binding
- Optimized Solution
- Unit Commitment and Energy Awards

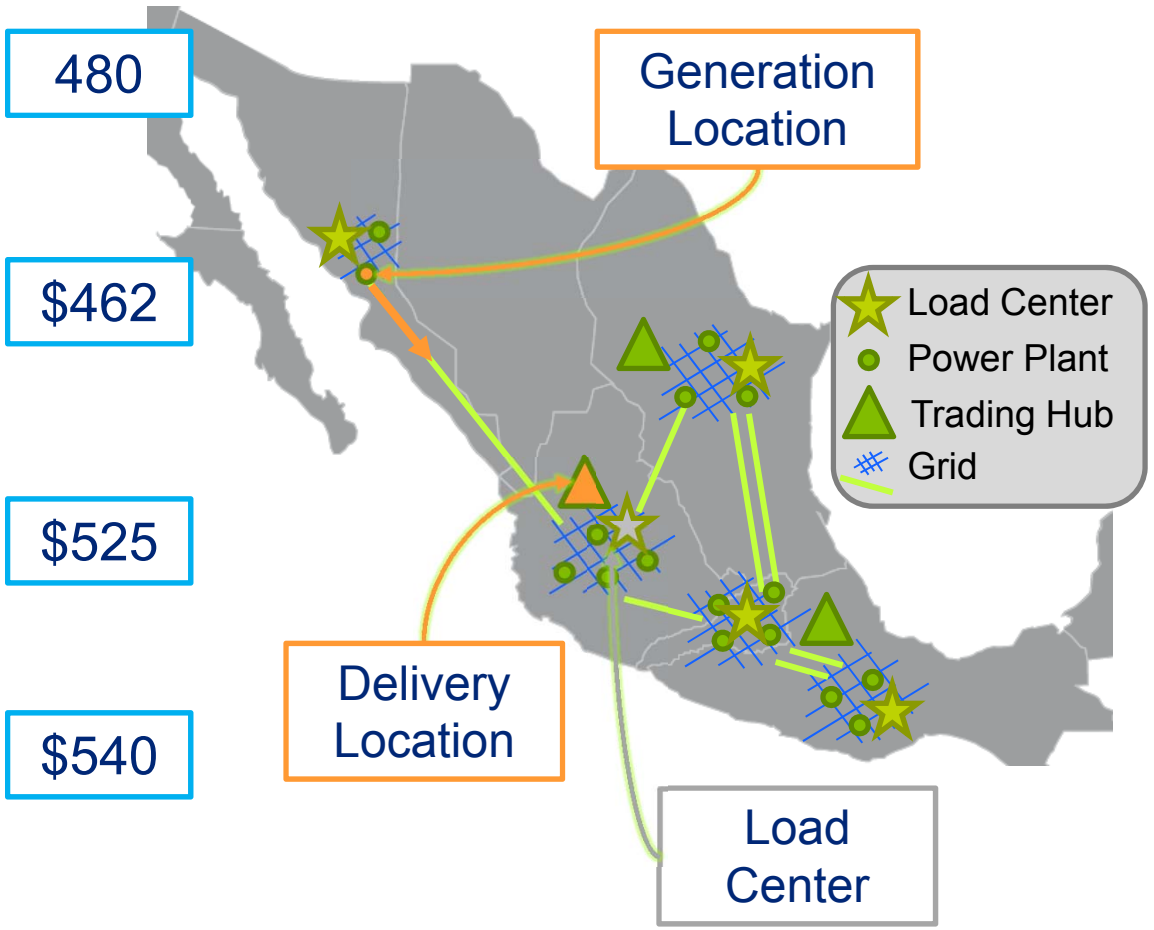
Participation:

- Rafael submits an offer (initially cost based in CENACE) to be committed and to sell energy to the Market Operator at the Day-Ahead LMP at the Generator Pnode
  - Generation plants may have bilateral Power Purchase Agreements – these are outside the Day-Ahead Market
  - For plants participating in the Day-Ahead Market, financial delivery is to the Market Operator, not a bilateral counterparty
- Load submits needs to purchase energy from the Market Operator at the Day-Ahead LMP at the Load Zone (initially MWs only in CENACE)
  - Load Serving Entities may have bilateral Power Purchase Agreements – these are outside the Day-Ahead Market
  - For load participating in the Day-Ahead Market, financial delivery is from the Market Operator, not a bilateral counterparty

Traditional Service: Example PPA

The Market Operator executes the Day-Ahead Market

- The Market Operator determines generation schedule
- The Market Operator "receives" power from Rafael and pays the Generator Pnode Day-Ahead LMP
- The Market Operator calculates Day-Ahead Trading Hub LMP
- The Market Operator "delivers" power to Anna and charges her the Day-Ahead Load Zone LMP



Standard Day-Ahead Market: PPA Settlement

Settlement of Day-Ahead Market with a Bilateral PPA and a corresponding Financial Schedule

	Rafael			Anna		
Line	Price	MWs	Settle	Price	MW	Settle
PPA Bilateral Settlement	$500	480	$240,000	$500	(480)	($240,000)
Day-Ahead Market Result	$462	480	$221,760	$540	(480)	($259,200)
Financial Schedule	$525	(480)	($252,000)	$525	480	$252,000
Total	$437	480	$209,760	$515	(480)	($247,200)

Standard Day-Ahead / Real-Time Interaction

The Real-Time Market is:

- Physically Binding (basically)
- Optimized Solution
- Energy Dispatches

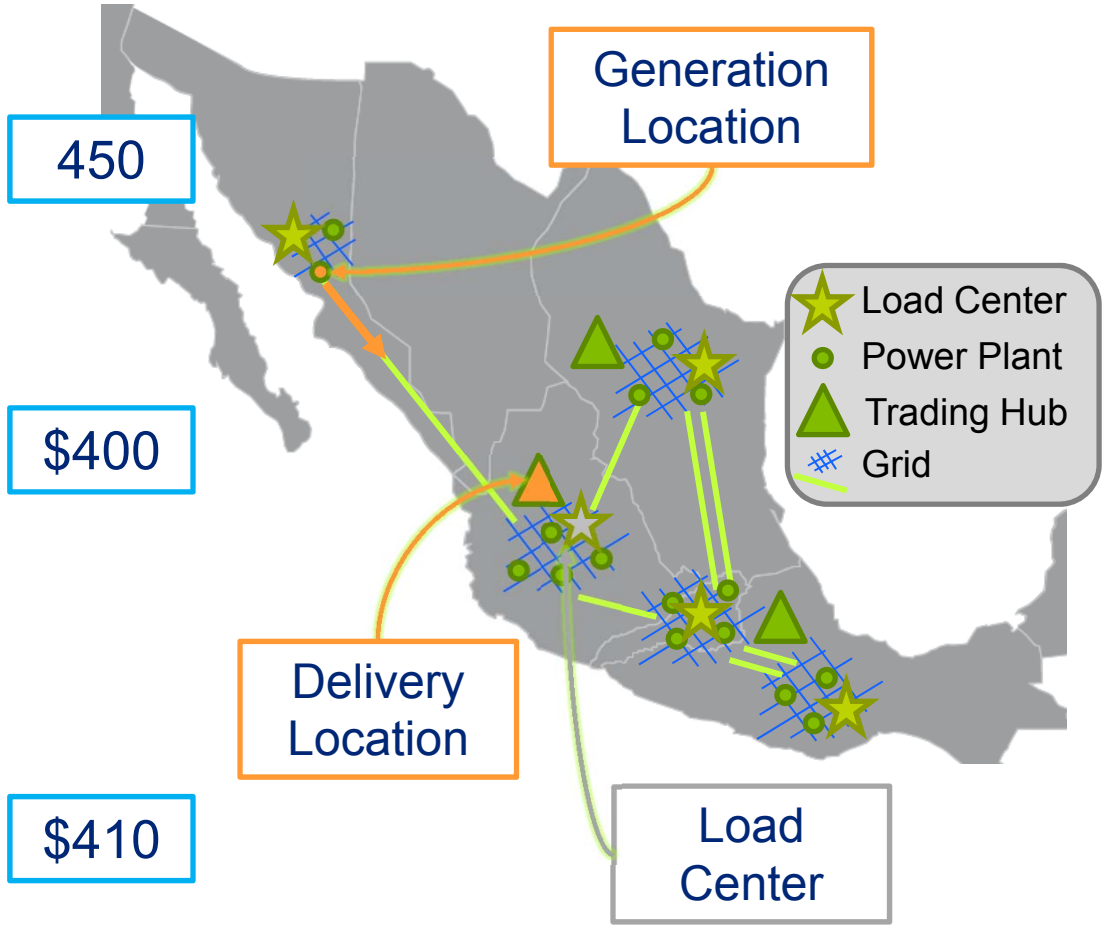
Participation:

- Rafael submits an offer (initially cost based in CENACE) to be dispatched up / down by the Market Operator at the Real-Time LMP at the Generator Pnode
  - Dispatches are relative to the Day-Ahead Awarded quantity
  - Generation plants may have bilateral Power Purchase Agreements – these are outside the Real-Time Market
- All load in excess of the Day-Ahead Award is served by the Market Operator at the Real-Time LMP at the Load Zone
  - Typically, Load does not take any action in Real-Time, the Market Operator is responsible for balancing

Traditional Service: Example PPA

The Market Operator executes the Real-Time Market

- The Market Operator determines generation dispatches and generators receive and follow dispatches
- The Market Operator receives power from Rafael and charges the Generator Pnode Real-Time LMP (dispatch down relative to Day-Ahead Award)
- The Market Operator delivers any additional power required by Anna and charges her the Real-Time Load Zone LMP



Standard Day-Ahead Market: PPA Settlement

Settlement of the Real-Time Market relative to Day-Ahead Award

	Rafael		
Line	Price	MWs	Settle
Day-Ahead Market Result	$462	480	$221,760
Real-Time Market Result	$400	(30)	$221,760
Total	$466	450	$209,760

Rafael must still physically perform to the 450 MW dispatch

- If Rafael were to under generate (e.g. 440 MWs), he would be charged back the Real-Time LMP for 10 MWs
- Note: This example simplifies the different time granularities of the Day-Ahead and Real-Time Market

FTR Background

- Purpose
- CENACE FTR Lifecycle

FTR Background: Purpose

Electricity Market restructuring separates scheduling of the transmission system from its ownership

- Open Access allows equal participation in the Market
- FTRs separate the rights to the value of Transmission Assets from the rights to schedule the movement of energy

In the Day-Ahead Market

- CENACE makes the decisions about which physical units to commit and the output levels needed to serve all load
- Congestion exists when the transmission system limits the ability to access the most economic resources
- Participant settlements reflect this congestion
- FTRs provide a mechanism to hedge this risk

FTR Background: CENACE FTR Lifecycle

General Process

- Physical Transmission Infrastructure is Created
- FTRs are Distributed to Participants
  - Annual Process
  - Monthly Process
- Day-Ahead Market Execution
- Settlement of the Day-Ahead Market and FTRs

FTR Background: CENACE FTR Startup

Special Start Up Processes for 2016 and 2017

- Legacy FTR Distribution
- Stage 1 Auction / Annual Process
- Stage 2 Auction / Monthly Process

- Scheduled for December 2015
- Currently in progress

- Scheduled for November 2016
- Likely to establish the recurring annual Auction

- Scheduled for January 2017
- Likely to be the first in the series of recurring monthly Auctions

FTR Characteristics (Market Bases 13.1)

- Characteristics & Attributes
- Basic Day-Ahead Settlement

FTR Characteristics: Definition of an FTR

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active Term of the FTR

- Financial
- Congestion Differential
- Day-Ahead
- Obligation
- Given Term

FTR Characteristics: Attributes of an FTR

Attributes of an FTR

- Owner
- MW Quantity
- Origin
- Destination
- Term
- Time of Day

FTR Characteristics: Origin & Destination

Origin and Destination

- Any Pnode
- Load Zones
- Trading Hubs
- Intertie Location

FTR Characteristics: Available Terms

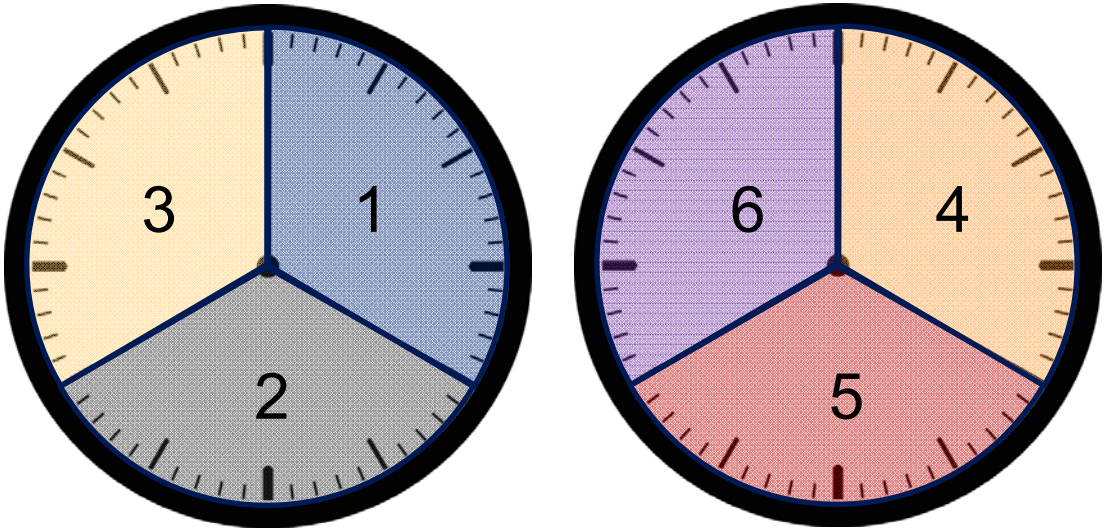
Term

- Month
- Season
  - January – March
  - April – June
  - July – September
  - October – December
- Remainder of Year
- One Year
- Three Years

FTR Characteristics: Available Time Blocks

Time of Day

1. 0:00 to 4:00
2. 4:00 to 8:00
3. 8:00 to 12:00
4. 12:00 to 16:00
5. 16:00 to 20:00
6. 20:00 to 24:00



Each Day in the Term is treated the same – there are no weekday / weekend differentiated products

FTR Day-Ahead Settlement Basics: Financial

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active term of the FTR

Characteristic	FTR	DA Market	Settlement
Owner	Giovani	Financial	Giovani
MW Quantity	100		100
Origin	A	MCC = $42	($17)
Destination	B	MCC = $25	
Term	June	OD = June 7	OD = June 7
Time of Day	12-16	OH = 14	OH = 14
			($1,700)

The FTR is Financial only –
Giovani does not participate in the Day-Ahead Market

FTR Day-Ahead Settlement Basics: Day-Ahead Market

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active term of the FTR

Characteristic	FTR	Day-Ahead	Settlement
Owner	Giovani		Giovani
MW Quantity	100		100
Origin	A	MCC = $42	($17)
Destination	B	MCC = $25	
Term	June	OD = June 7	OD = June 7
Time of Day	12-16	OH = 14	OH = 14
			($1,700)

Only Day-Ahead Market MCCs are relevant to FTR Settlements

FTR Day-Ahead Settlement Basics: Congestion Differential

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active term of the FTR

Characteristic	FTR	DA Market	Settlement
Owner	Giovani		Giovani
MW Quantity	100		100
Origin	A	Congestion Differential	
Destination	B		
Term	June	OD = June 7	OD = June 7
Time of Day	12-16	OH = 14	OH = 14
			($1,700)

FTR Settlement Price = DA MCC $_{Destination}$ minus DA MCC $_{Origin}$

FTR Day-Ahead Settlement Basics: Term

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active term of the FTR

Characteristic	FTR	DA Market	Settlement
Owner	Giovani		Giovani
MW Quantity	100		100
Origin	A	MCC = $42	($17)
Destination	B	MCC = $25	
Term	June	OD = June 7	OD = June 7
Time of Day	12-16	OH = 14	Term

($1,700)

The Day-Ahead Market Operating Hour falls within the active Term of the FTR

FTR Day-Ahead Settlement Basics: Obligation

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active term of the FTR

Characteristic	FTR	DA Market	Settlement
Owner	Giovani		Giovani
MW Quantity	100		100
Origin	A	MCC = $42	($17)
Destination	B	MCC = $25	
Term	June	OD = June 7	OD = June 7
Time of Day	12-16	OH = 14	OH = 14

Obligation

The congestion goes against Giovani – he is obligated to pay the differential

FTR Day-Ahead Settlement Basics: Summary

A financial obligation to Day-Ahead Market hourly congestion differential between an Origin and Destination location during the active term of the FTR

Characteristic	FTR	DA Market	Settlement
Owner	Giovani		Giovani
MW Quantity	100		100
Origin	A	MCC = $42	($17)
Destination	B	MCC = $25	
Term	June	OD = June 7	OD = June 7
Time of Day	12-16	OH = 14	OH = 14
			($1,700)

Legacy Transmission Rights (Market Bases 13.2)

- Example Introduction
- Determining Potential Legacy FTRs
- Determining Legacy FTR Feasibility
- Legacy FTR Awards

Example Introduction: Four Scenarios for Today

	Giovani	Maribel	Rafael	Nayeli
Position	Interconnection Customer with Legacy Rights	Basic Service Supplier with Legacy Rights	Generator with no Legacy Rights	Counter Flow Bidder
Purpose	Hedge congestion to the Load Center associated with Legacy Agreement	Hedge congestion to the Load Center associated with Load Service	Hedge congestion to the Trading Hub associated with Power Sale	Profit from overly conservative expectations of Spring congestion
Participates In	Legacy Process for Interconnection Customers	Legacy Process for Basic Service Suppliers	Stage 1 Auction	Stage 2 Auction
Origin	A	C1, C2, C3	E	F
Destination	B	D	F	E
Desired Duration	2017	2017	2017	2Q 2017
Time of Day	24 Hours	24 Hours	04 to 20	12 to 16
Desired MWs	200	900	480	90

Example Introduction: Our Participants

	Giovani	"Marigol"	"Rafa"	Nayeli
Position	Interconnection Customer with Legacy Rights	Basic Service Supplier with Legacy Rights	Generator with no Legacy Rights	Counter Flow Bidder
Purpose	Hedge congestion to the Load Center associated with Legacy Agreement	Hedge congestion to the Load Center associated with Load Service	Hedge congestion to the Trading Hub associated with Power Sale	Profit from overly conservative expectations of Spring congestion
Participates In	Legacy Process for Interconnection Customers	Legacy Process for Basic Service Suppliers	Stage 1 Auction	Stage 2 Auction
Origin	A	C1, C2, C3	E	F
Destination	B	D	F	E
Desired Duration	2017	2017	2017	2Q 2017
Time of Day	24 Hours	24 Hours	04 to 20	12 to 16
Desired MWs	200	900	480	90

Legacy FTRs: Establishing Legacy FTR Eligibility

Potential Legacy FTRs are allocated to eligible entities

- Legacy Interconnection or Transmission Service Customers
- Basic Service Suppliers

CENACE will calculate Legacy FTRs for all eligible entities whether or not the entity obtains the FTRs

- Legacy FTRs for unconverted Legacy FTRs are held by an "Intermediary Generator"
- May be possible to return to Legacy Contract provisions

Giovani → Converts Legacy Interconnection Agreement for one Power Plant and one Load Center. Wants 200 MWs.

Marigol → Enters into Legacy Contract with Legacy Power Plants. Serves customers at one Load Center. Wants 900 MWs.

Legacy FTRs: Determining Potential Legacy FTR Quantities

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Calculate historical average generation and consumption

- Two year period from August 12, 2012 to August 11, 2014
- Interconnection Customers – Agreement Driven
- Basic Service Suppliers – Historical CFE Obligation Driven

Potential Legacy FTR quantity is the lesser of historical average generation or historical average consumption

Legacy FTRs: Determining Potential Legacy FTR Quantities

Legacy Process → Legacy Results → Stage 1 Auction → Stage 1 Awards → Stage 2 Auction → Stage 2 Awards → Ongoing Process

Generation	Consumption
180	200
165	200
195	200
180	200

Average

Giovani is potentially eligible for only 180 of the desired 200 MWs of Legacy FTRs

Generation	Consumption
975	925
1,025	950
925	825
975	900

Average

Marigol is potentially eligible for 900 MWs of Legacy FTRs

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Legacy FTRs: Determining Feasibility of Potential Legacy FTRs

The core distribution mechanism for *all* FTRs is a Simultaneous Feasibility Test (SFT)

General SFT Process

- Create Network Model
- Define Objective Function
- Create Injections / Withdrawals
- Determine DC Power Flow
- Maximize Objective Function subject to Network Model Constraints
- Determine Awards

Legacy FTRs: Determining Feasibility of Potential Legacy FTRs

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Legacy FTR SFT Process

- Create Network Model → As of 8/12/14
- Define Objective Function → Maximize feasible consumption

Legacy FTRs: Determining Feasibility of Potential Legacy FTRs

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Legacy FTR SFT Process

- Create Injections / Withdrawals

Potential Legacy FTRs from historical analysis

Potential Legacy FTRs Multiplied by 4/3

Origin

Destination

Giovani
240 MW

Destination

Marigol
1,200 MW

Marigol
440 MW
480 MW
280 MW

Origin

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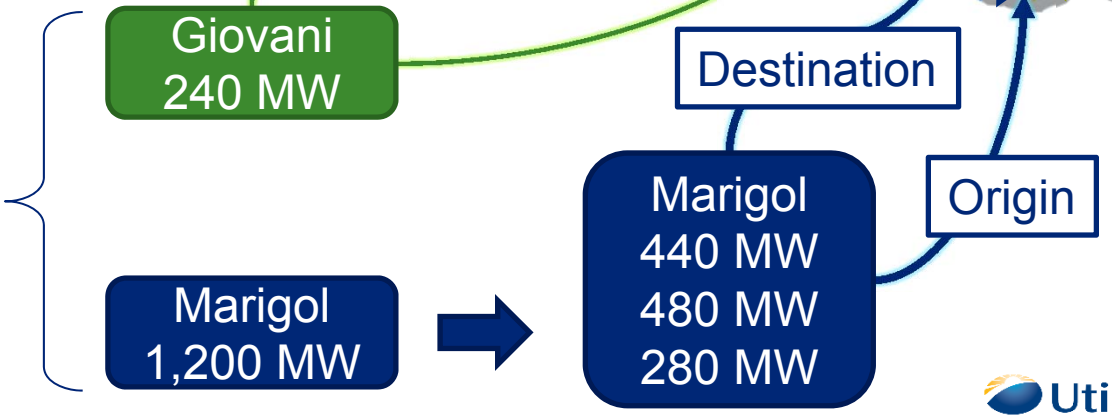
Determining Feasibility of Potential Legacy FTRs *

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Legacy FTR SFT Process

- Determine DC Power Flow
- Maximize Objective Function subject to Network Model Constraints

Potential Legacy FTRs Multiplied by 4/3



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Legacy FTRs: Legacy FTR Awards

Legacy FTR SFT Process

- Determine Awards

Owner	FTR	Start	End	Time	Origin	Destination	MWs
Giovani	1	1/1/17	12/31/17	0-4	A	B	180
Giovani	2	1/1/17	12/31/17	4-8	A	B	180
…	…	…	…	…	…	…	…
Marigol	7	1/1/17	12/31/17	0-4	C1	D	325
Marigol	8	1/1/17	12/31/17	0-4	C2	D	350
Marigol	9	1/1/17	12/31/17	0-4	C3	D	200
…	…	…	…	…	…	…	…

Marigol wanted 900 MWs total to her Destination. The injection was distributed to three Origins. It was also infeasible and therefore the total was reduced to 875 in the SFT.

Legacy FTRs: Accepting or Rejecting Legacy FTRs

Following the SFT, the Legacy Customer can Accept or Reject the feasible Legacy FTRs

- There is no cost to Accepting the feasible Legacy FTRs
- If a Customer Accepts Legacy FTRs, it can later Reject them
- Once Rejected, Legacy FTRs cannot be recovered
- Rejected Legacy FTRs go into a deposit account

Legacy FTRs: Other Provisions

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Other Provisions

- Legacy FTR Process is planned to run once and cover legacy rights for every year from 2016 to 2035
- Legacy FTRs will be distributed to a Intermediary Generator for Legacy Customers who do not convert their contracts
- The Legacy FTR Process reflects differing contract times / durations / quantities and assumed generation and load
- Addition or withdrawal of a Load Center will cause a monthly recalculation of Legacy FTRs.
- Legacy FTRs will to convert to Rights to Auction Income

Lunch

Stage 1 FTR Auctions (Market Bases 13.3)

- Example Refresh
- Creating FTR Bids & Credit Calculations
- Credit Calculations
- Determining FTR Feasibility
- FTR Auction Awards
- FTR Auction Settlements

Example Refresh: Our Participants

	Giovani	"Marigol"	"Rafa"	Nayeli
Position	Interconnection Customer with Legacy Rights	Basic Service Supplier with Legacy Rights	Generator with no Legacy Rights	Counter Flow Bidder
Purpose	Hedge congestion to the Load Center associated with Legacy Agreement	Hedge congestion to the Load Center associated with Load Service	Hedge congestion to the Trading Hub associated with Power Sale	Profit from overly conservative expectations of Spring congestion
Participates In	Legacy Process for Interconnection Customers	Legacy Process for Basic Service Suppliers	Stage 1 Auction	Stage 2 Auction
Origin	A	C1, C2, C3	E	F
Destination	B	D	F	E
Desired Duration	2017	2017	2017	2Q 2017
Time of Day	24 Hours	24 Hours	04 to 20	12 to 16
Desired MWs	200	900	480	90

Stage 1 FTR Auction: FTR Offers

Legacy Process | Legacy Results | **Stage 1 Auction** | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Stage 1 begins November 2016

Only one year terms are available

Participants submit economic Bids for desired FTRs

- Any Origin and Destination
- Bid Price can be positive or negative
- Multiple Bids valid for the same Origin & Destination
- Credit is checked as part of the Bid process
- A cost per Bid is assessed

Submits a price sensitive Bid with three effective price points:

1. 300 MWs for $75 for Hours 4-20
2. 90 MWs for $40 for Hours 4-20
3. 90 MWs for $25 for Hours 4-20

Stage 1 FTR Auction: Credit Requirements

Legacy Process | Legacy Results | **Stage 1 Auction** | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Bid MWh * Risk Value + Safety Margin

Bid	Days	Hours	MW	MWh	Risk Value	Credit Required
1	365	16	300	1,752,000	$250	$438,000,000
2	365	16	90	525,600	$250	$131,400,000
3	365	16	90	525,600	$250	$131,400,000
					Safety Margin	$5,000,000
					Total Credit Required	**$705,800,000**

Following the Auction, Credit is released for any Bids that are not awarded.

Stage 1 FTR Auction: Determining Feasibility of Bids

Legacy Process | Legacy Results | **Stage 1 Auction** | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

The core distribution mechanism for *all* FTRs is a Simultaneous Feasibility Test (SFT)

General SFT Process

- Create Network Model
- Define Objective Function
- Create Injections / Withdrawals
- Determine DC Power Flow
- Maximize Objective Function subject to Network Model Constraints
- Determine Awards

Stage 1 FTR Auction: Determining Feasibility of Bids

Legacy Process | Legacy Results | **Stage 1 Auction** | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

FTR Auction SFT Process

- Create Network Model → Forecast for FTR Duration for each Period (6)
- Define Objective Function → Maximize total economic surplus

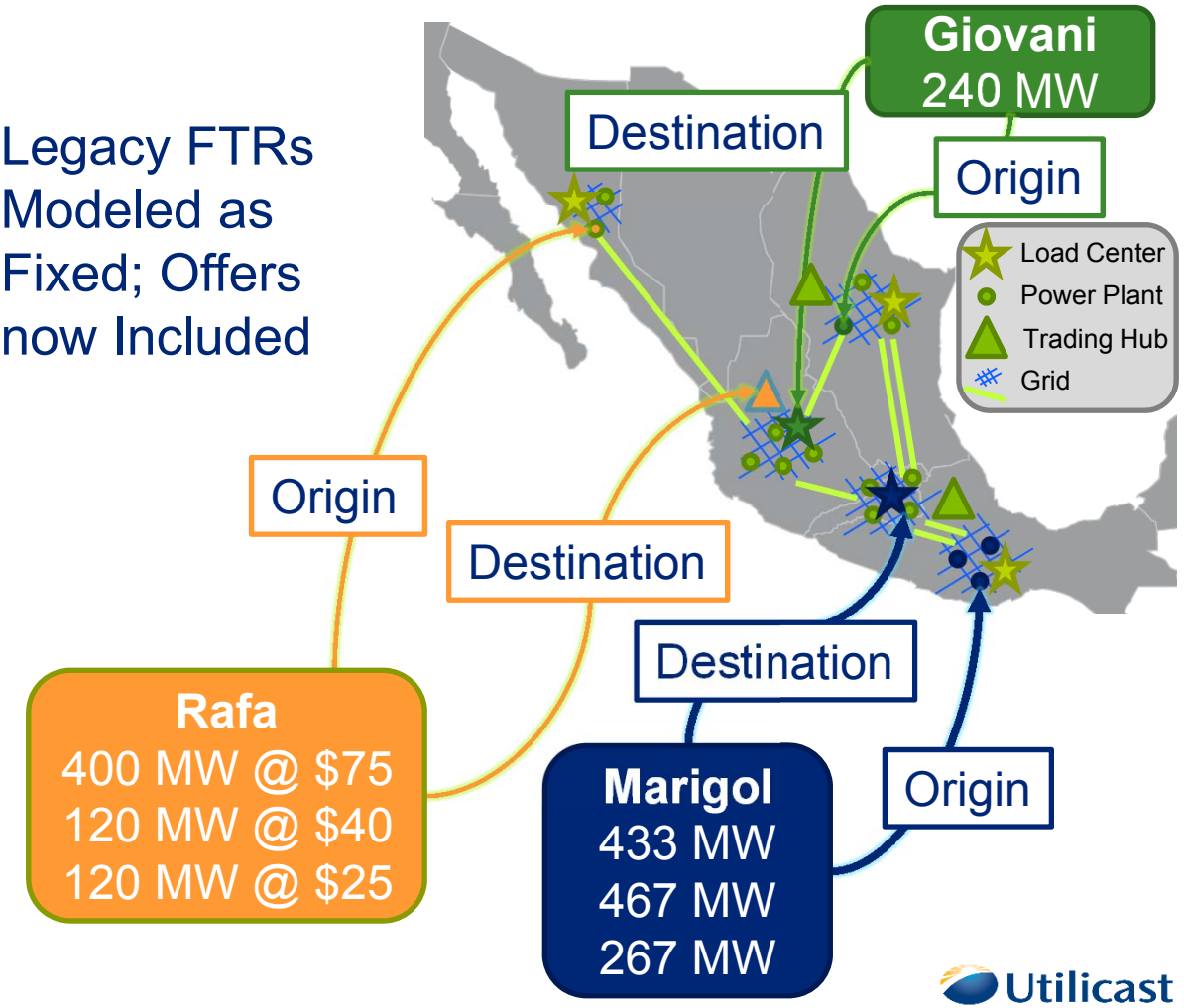
Stage 1 FTR Auction: Determining Feasibility of Bids *

Legacy Process | Legacy Results | **Stage 1 Auction** | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

FTR Auction SFT Process

- Create Injections / Withdrawals → Legacy FTRs Modeled as Fixed; Offers now Included

Bids are Multiplied by 4/3 →



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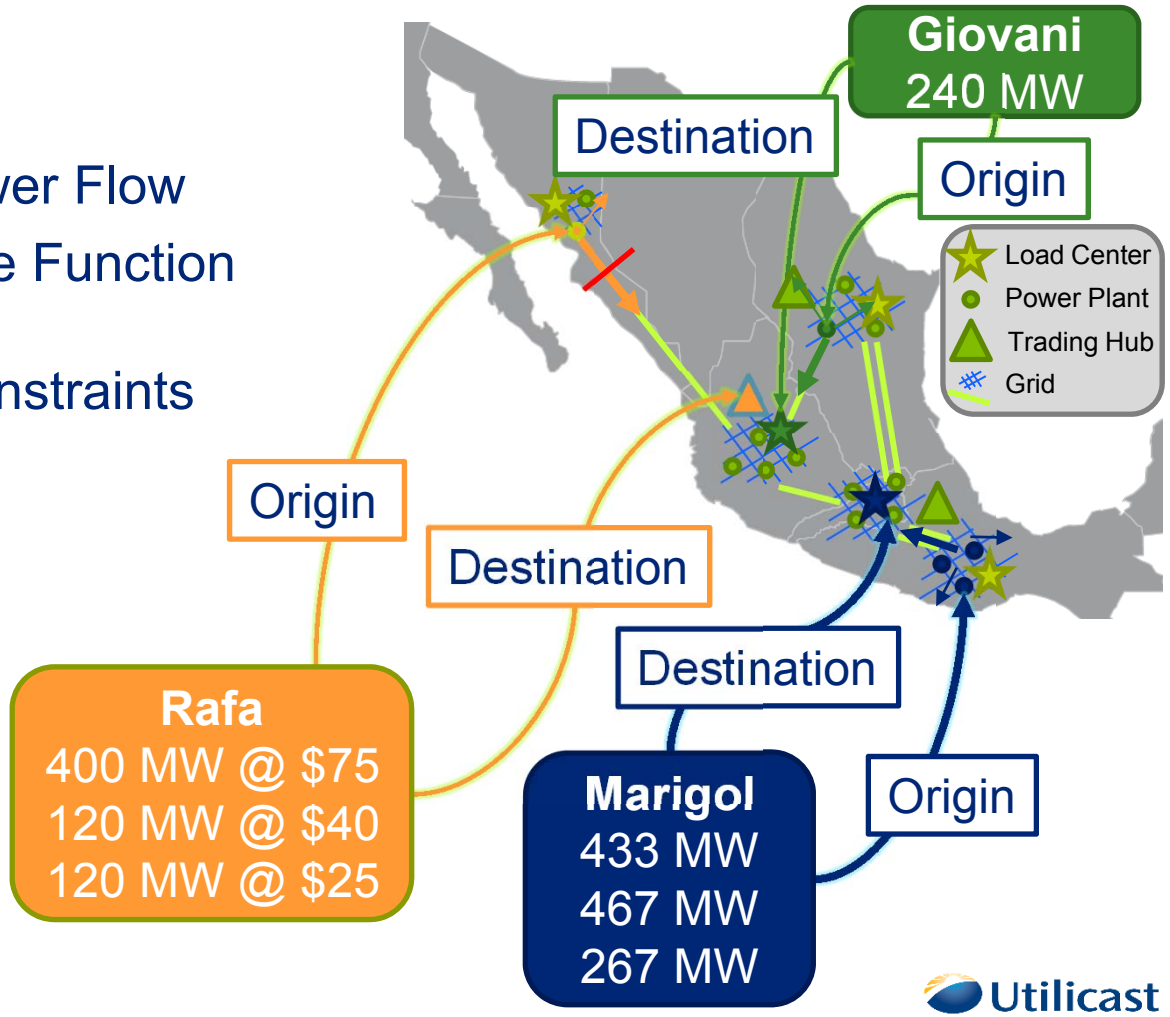
Stage 1 FTR Auction: Determining Feasibility of Bids *

Legacy Process | Legacy Results | **Stage 1 Auction** | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

FTR Auction SFT Process

- Determine DC Power Flow
- Maximize Objective Function subject to Network Model Constraints



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Stage 1 FTR Auction: FTR Auction Awards

Legacy Process | Legacy Results | Stage 1 Auction | **Stage 1 Awards** | Stage 2 Auction | Stage 2 Awards | Ongoing Process

FTR Auction Results

- Determine Awards

Owner	FTR	Start	End	Time	Origin	Destination	MWs
Rafa	25	1/1/17	12/31/17	4-8	E	F	300
Rafa	26	1/1/17	12/31/17	4-8	E	F	90
…	…	…	…	…	…	…	…
Rafa	31	1/1/17	12/31/17	16-20	E	F	300
Rafa	32	1/1/17	12/31/17	16-20	E	F	90

The Shadow Price at F is $57 and the Shadow Price at E is $26 for a Clearing Price = $31:

1. 300 MWs for $75 – Awarded
2. 90 MWs for $40 – Awarded
3. ~~90 MWs for $25~~ – Not Awarded

} Rafa is awarded a total of 390 MWs

The feasible FTRs are multiplied by 3/4 to re-scale them to the original Bid quantities.

Stage 1 FTR Auction: Auction Settlements *

Legacy Process | Legacy Results | Stage 1 Auction | **Stage 1 Awards** | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Positively valued FTRs awarded through the Auction are settled five days after the Auction

Owner	FTR	Clearing Price	MWs	Hours	Settlement
Rafa	25	$31	300	1,460	$13,578,000
Rafa	26	$31	90	1,460	$4,073,400
…	…	…	…	…	…
Rafa	31	$31	300	1,460	$13,578,000
Rafa	32	$31	90	1,460	$4,073,400

Note: Rafa also owes the Bid Cost (assumed $5) for the total number of Bids submitted:

1. 300 MWs for $75 for Hours 4-20 – 4 Bids * $5/Bid = $20
2. 90 MWs for $40 for Hours 4-20 – 4 Bids * $5/Bid = $20
3. 90 MWs for $25 for Hours 4-20 – 4 Bids * $5/Bid = $20

} $60

Standard Day-Ahead Market: PPA Settlement

Settlement of Day-Ahead Market with a Bilateral PPA and a corresponding Financial Schedule and an FTR held by Rafa

	Rafael			Anna		
Line	Price	MWs	Settle	Price	MW	Settle
PPA Bilateral Settlement	$500	480	$240,000	$500	(480)	($240,000)
Day-Ahead Market Result	$462	480	$221,760	$540	(480)	($259,200)
Financial Schedule	$525	(480)	($252,000)	$525	480	$252,000
FTR DA Settlement	$63	390	$24,570			
FTR Auction Purchase	$31	390	($12,090)			
Total	$463	480	$222,240	$515	(480)	($247,200)

* Assume losses are $0 / MWh for simplicity.

FTR Auctions: Other Provisions

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Other Provisions

- The Deposit and Management Account will offer any previously rejected FTRs at zero price
- If a participant “possesses” an FTR for an origin / destination and the reverse FTR for the same origin / destination, CENACE will cancel the FTRs
- Auction Settlements:
  - Positively Valued – Settlements executed 5 days after the Auction
  - Negatively Valued – Settlements executed concurrent with Day-Ahead Market Settlements

Stage 2 FTR Auctions (Market Bases 13.3)

- Example Refresh
- Creating FTR Bids & Credit Calculations
- Determining FTR Feasibility
- FTR Auction Awards
- FTR Auction Settlements
- Rights to Auction Income

Example Refresh: Our Participants

	Giovani	"Marigol"	"Rafa"	Nayeli
Position	Interconnection Customer with Legacy Rights	Basic Service Supplier with Legacy Rights	Generator with no Legacy Rights	Counter Flow Bidder
Purpose	Hedge congestion to the Load Center associated with Legacy Agreement	Hedge congestion to the Load Center associated with Load Service	Hedge congestion to the Trading Hub associated with Power Sale	Profit from overly conservative expectations of Spring congestion
Participates In	Legacy Process for Interconnection Customers	Legacy Process for Basic Service Suppliers	Stage 1 Auction	Stage 2 Auction
Origin	A	C1, C2, C3	E	F
Destination	B	D	F	E
Desired Duration	2017	2017	2017	2Q 2017
Time of Day	24 Hours	24 Hours	04 to 20	12 to 16
Desired MWs	200	900	480	90

Stage 2 FTR Auction: FTR Offers

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | **Stage 2 Auction** | Stage 2 Awards | Ongoing Process

In Stage 2 begins January 2017

Stage 2 appears to begin the recurring Monthly Process

Additional FTR terms are created

- Monthly
- Remainder of Year
- Season – Standard Quarters
- 3 Years

Anticipate that only the Monthly and Remainder of Year will be offered in the Monthly Process

Bid characteristics are the same as in Stage 1

Submits a price sensitive Bid with two effective price points:

1. 60 MWs for ($15) for Hours 12-16
2. 30 MWs for ($20) for Hours 12-16

Stage 2 FTR Auction: Credit Requirements

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | **Stage 2 Auction** | Stage 2 Awards | Ongoing Process

Bid MWh * Risk Value + Safety Margin

Bid	Days	Hours	MW	MWh	Risk Value	Credit Required
1	91	4	60	21,840	$250	$5,460,000
2	91	4	30	10,920	$250	$2,730,000
					Safety Margin	$5,000,000
					Total Credit Required	**$13,190,000**

Following the Auction, Credit is released for any Bids that are not awarded.

Stage 2 FTR Auction: Determining Feasibility of Bids

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | **Stage 2 Auction** | Stage 2 Awards | Ongoing Process

The core distribution mechanism for *all* FTRs is a Simultaneous Feasibility Test (SFT)

General SFT Process

- Create Network Model
- Define Objective Function
- Create Injections / Withdrawals
- Determine DC Power Flow
- Maximize Objective Function subject to Network Model Constraints
- Determine Awards

Stage 2 FTR Auction: Determining Feasibility of Bids

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | **Stage 2 Auction** | Stage 2 Awards | Ongoing Process

FTR Auction SFT Process

- Create Network Model → Forecast for FTR Duration for each Period
- Define Objective Function → Maximize total economic surplus

Stage 2 FTR Auction: Determining Feasibility of Bids *

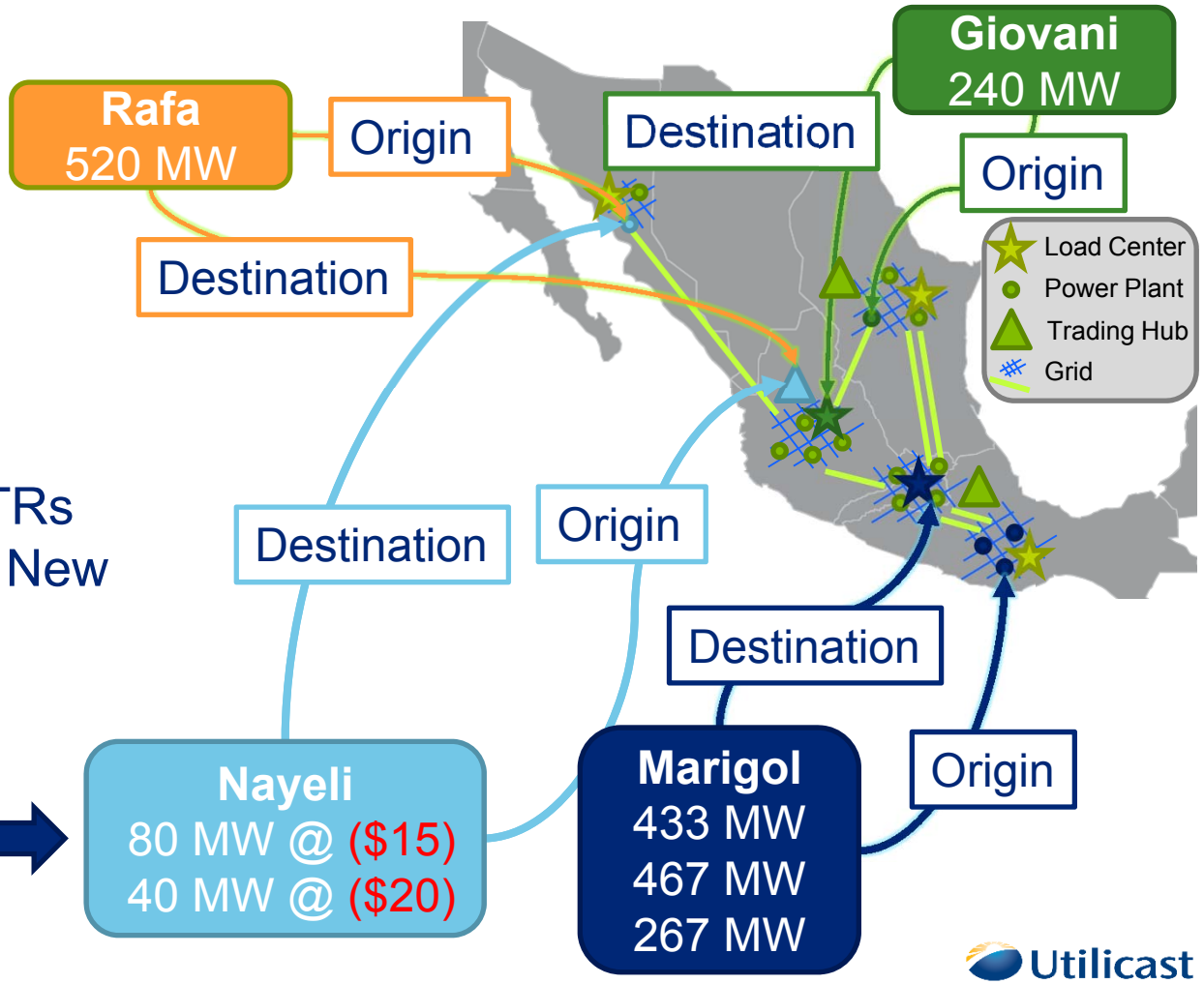
Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | **Stage 2 Auction** | Stage 2 Awards | Ongoing Process

FTR Auction SFT Process

- Create Injections / Withdrawals

Previously Awarded FTRs are Modeled as Fixed; New Offers now Included

Bids Multiplied by 4/3



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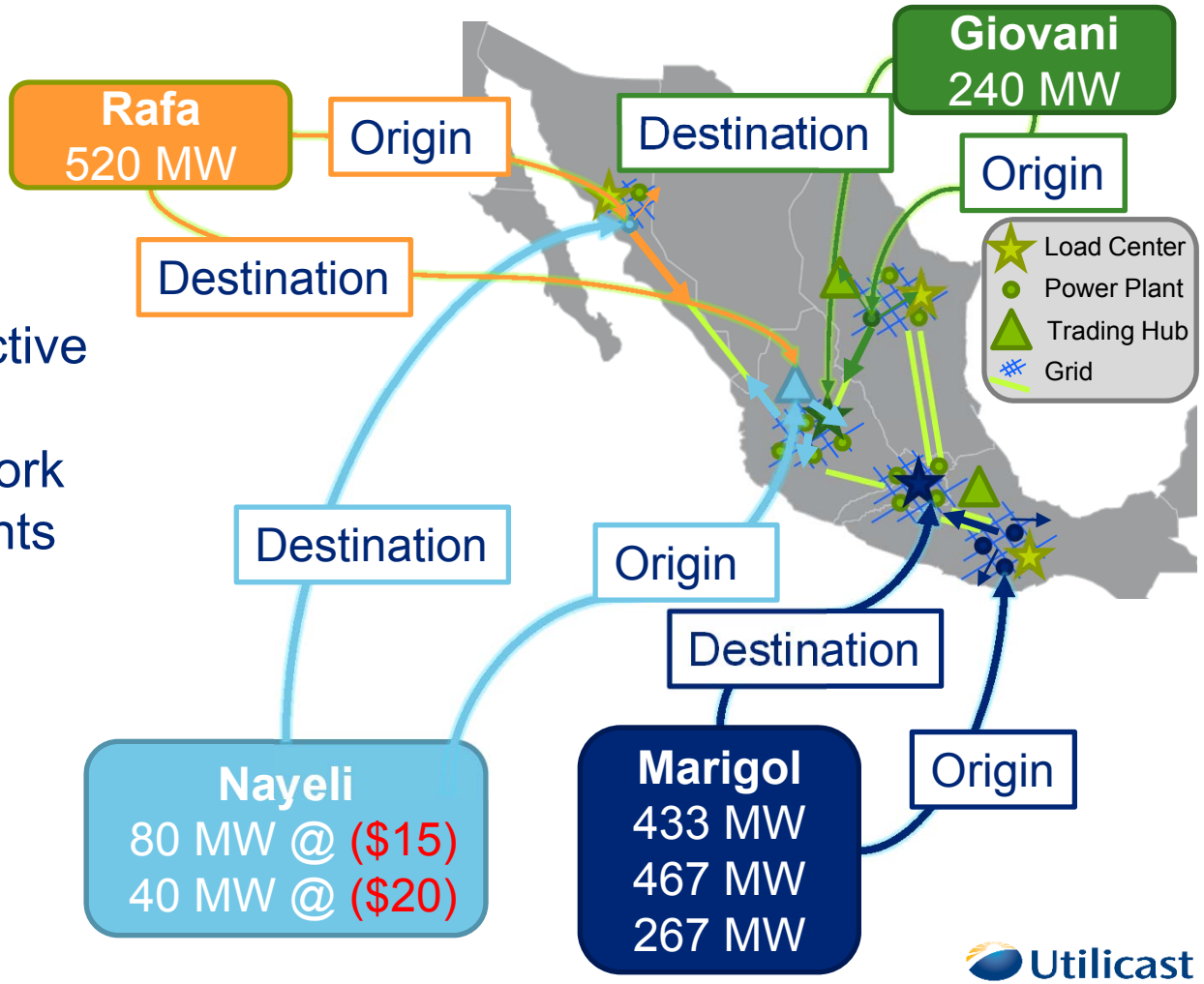
Stage 2 FTR Auction: Determining Feasibility of Bids *

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | **Stage 2 Auction** | Stage 2 Awards | Ongoing Process

FTR Auction SFT Process

- Determine DC Power Flow
- Maximize Objective Function subject to Network Model Constraints



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Stage 2 FTR Auction: FTR Auction Awards

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | **Stage 2 Awards** | Ongoing Process

FTR Auction Results

- Determine Awards

Owner	FTR	Start	End	Time	Origin	Destination	MWs
Nayeli	33	4/1/17	6/30/17	12-16	F	E	90

The Shadow Price at E is $29 and the Shadow Price at F is $52 for a Clearing Price = ($23):

1. 60 MWs for ($15) – Awarded
2. 30 MWs for ($20) – Awarded

} Nayeli is awarded a total of 90 MWs

The feasible FTRs are multiplied by 3/4 to re-scale them to the original Bid quantities.

What about Rafa's 90 MWs that were infeasible in Stage 1?

Stage 2 FTR Auction: Auction Settlements

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | **Stage 2 Awards** | Ongoing Process

Negatively valued FTRs awarded through the Auction are settled at the same time as the corresponding Day-Ahead Market settlements during the active term

Owner	FTR	Clearing Price	MWs	Hours	Settlement
Nayeli	33	($23)	90	364	($753,480)

Note: Nayeli also owes the Bid Cost (assumed $5) for the total number of Bids submitted:

1. 60 MWs for ($15) for Hours 12-16 – 1 Bid * $5/Bid = $5
2. 30 MWs for ($20) for Hours 12-16 – 1 Bid * $5/Bid = $5

} $10

Ongoing FTR Auctions: Likely Ongoing Process

Likely Annual Process

- Executed each year in Autumn beginning in 2017
- Distributes seasonal, one year and three year FTRs

Likely Monthly Process

- Executed each month to distribute capacity not distributed during the Annual Process
- Distributes monthly and remainder of year FTRs

Rights to Auction Income: Purpose

"In the Second Stage market, Legacy FTRs…become Rights to Auction Income"

- Allows holders of Legacy FTRs to receive either FTRs matching their Legacy Rights "for free" – OR –
- the value of the Legacy Rights directly from the Auction

Used in US Markets to create a more transparent and liquid Auction while respecting Legacy Rights

- Typically Rights to Auction Income (RAI) are issued / validated as part of the Annual Process

Rights to Auction Income: Use and Valuation in an Auction

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Using RAI to obtain an FTR

- Submit an FTR Bid in an Auction which matches the Legacy FTR Origin and Destination
- The FTR will (likely) clear, potentially at a very high price, depending on the bid submitted
- Purchase the FTR in the normal Auction Settlement process
- Receive Auction revenue corresponding to RAI position

Using RAI but not obtaining an FTR

- Do not submit a Bid to the Auction
- Receive Auction revenue corresponding to RAI position

FTR Auctions: Other Provisions

Legacy Process | Legacy Results | Stage 1 Auction | Stage 1 Awards | Stage 2 Auction | Stage 2 Awards | Ongoing Process

Other Provisions

- Legacy FTRs held by the Intermediary Generator for Legacy Customers who have not converted their contracts continue to be represented as fixed injections / withdrawals
- Bids for 3-Year FTR terms cannot be different for different years in the term
- Legacy FTRs and associated RAI may be cancelled if the load they were issued on behalf of migrates to new supplier
- Cancelled FTRs remain in a settlement account for uplift
- Residue is returned through the FTR Auctions Residue Account
- FTR Auction and FTR settlements are part of the Day-Ahead settlements process for neutrality purposes

Profit and Loss: Who Were the Winners?

Each of the four Participants received at least one FTR

- Auction Results from either Stage 1 or Stage 2
- Day-Ahead Market for Operating Hour June 6, 2017 Hour 14

Owner	FTR	MWs	Clearing Price	MCC_O	MCC_D	Congestion Differential	Profit (Loss)
Giovani	4	180	$0	$43	$75	$32	[($0) + $32] * 180 = $5,760
Marigol	17	350	$0	$68	$56	($12)	[($0) + ($12)] * 350 = ($4,200)
Rafa	30	90	$31	$22	$40	$18	[($31) + $18] * 90 = ($1,170)
Nayeli	33	90	($23)	$40	$22	($18)	[($23) + ($18)] * 90 = $450

Profit (Loss) = [-1 * Auction Cost + DA MCC Differential] * MWs

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Profit and Loss: Who Were the Winners?

A Second Settlement Example

- Day-Ahead Market for Operating Hour December 8, 2017 Hour 20
- Nayeli's FTR is expired

Owner	FTR	MWs	Clearing Price	MCC_O	MCC_D	Congestion Differential	Profit (Loss)
Giovani	4	190	$0	$24	$24	$0	[($0) + $0] * 180 = $0
Marigol	17	350	$0	$12	$18	$6	[($0) + $6] * 350 = $2,100
Rafa	30	90	$31	$22	$55	$33	[($31) + $33] * 90 = $180

Profit (Loss) = [-1 * Auction Cost + DA MCC Differential] * MWs

Transmission & Distribution Upgrades (Market Bases 13.4)

- Determining Incremental Capacity
- Obtaining FTRs

Anchoring Expansion of the T&D System: Market Base 13.4

Participants that fund Network Upgrades are eligible to receive FTRs

A special process is run to allocate the Upgrade FTRs

- CENACE will develop a Network Model representing the upgraded facilities to compare to the Base Case
- Existing FTRs will be modeled as fixed injections / withdrawals to ensure they remain feasible
- Funders specify their desired origin / destination
- If more than one participant funded the expansion, a common origin / destination must be chosen

Anchoring Expansion of the T&D System: Market Base 13.4

The core distribution mechanism for *all* FTRs is a Simultaneous Feasibility Test (SFT)

- CENACE will calculate the existing available capacity between the selected origin and destination in the Base Case
- CENACE will execute a SFT on the expanded Network Model
  - The Net Capacity Increase is determined by increasing Injections and Withdrawals until a feasible solution can no longer be found
  - The percentage capacity increase attributable to the Upgrade is calculated
  - FTRs will be issued equal to the Net Capacity Increase multiplied by the percentage attributable to the Upgrade
- The Term for Upgrade FTRs is 30 years

Closing Thoughts & International Perspectives

Perspectives: Some Thoughts

CENACE's FTR design is broadly similar to US Markets

- FTR Characteristics / Definition are essentially identical
- The RAI model is similar to the approach in the Eastern Interconnect
- Appears to have adopted approaches learning from challenges with negatively valued FTRs and Allocation challenges

Some Differences

- Most US Markets include a Secondary Market for transferring FTRs
- The 3 Year Term is relatively short compared to US Markets
- Cancellation of FTRs corresponding to load migration is a different approach than used in US Markets to address the same issue
- The holding of the non-converted Legacy FTRs by the Intermediary Generator is different than US Markets

Perspectives: Some Thoughts

Credit Policy

- Not differentiated by origin / destination
- Safety Margin seems small in comparison to Risk Value

Market Monitoring

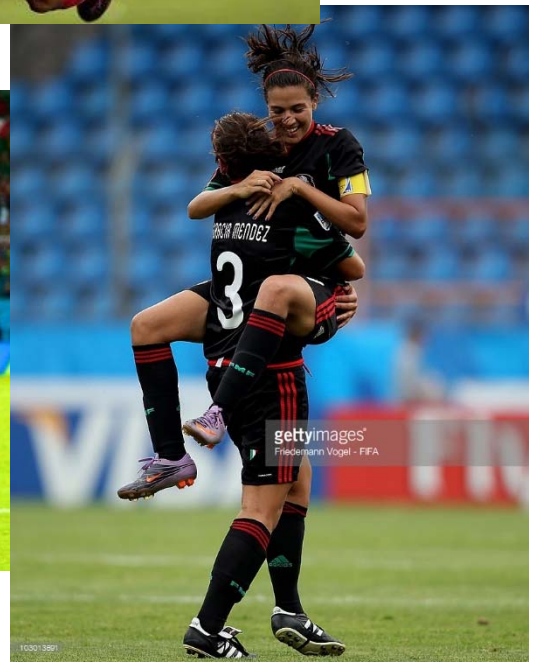
- FTRs are a financial tool that can pose risks to the Market
- Assume monitoring is in place to monitor behavior

FTRs as an incentive for Network Upgrades

- Common provision in US Markets
- Most Network Upgrades continue to be built under funding structures other than FTRs

Perspectives: Some Thoughts

When Markets drive efficiencies



Everybody Celebrates

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Disclaimer: Reminder

- This presentation is based on available information:
  - Translation of the Market Bases dated September 12, 2015
  - Translations of some Draft Manuals
  - Supplemented by approaches for FTR Markets in the US
- Additional Details on the Auction schedules and software systems will be available in a FTR Manual in the future
- Participants, locations, prices, bids, etc. are illustrative only
- Calculations and data are simplified for illustrative purposes

Questions: Open Forum

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