

A satellite view of the Earth at night, showing the illuminated continents of North and South America against the dark background of space.

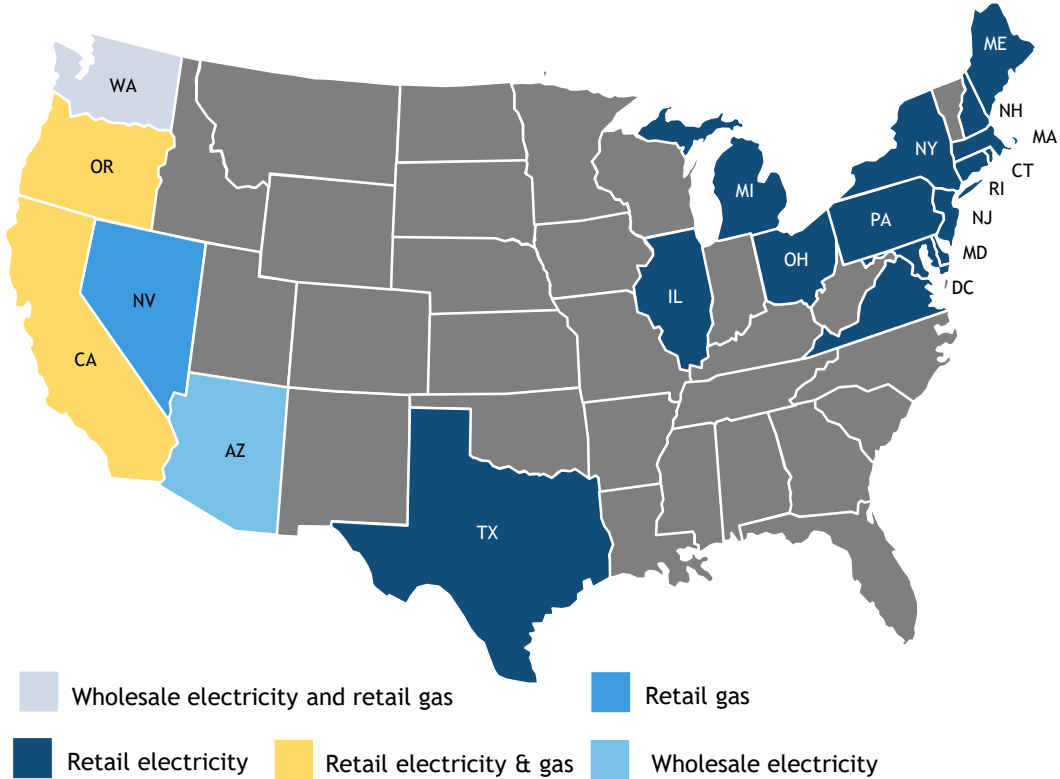
Calpine Energy Solutions

NYISO On & Off Peak TCC Proposal

ICAP/MIWG April 22, 2020

BPWG April 30, 2020

Calpine Energy Solutions



- Licensed to sell gas and power in 64 utility territories across 20 states
- Serves more than 1,300 exclusively commercial and industrial customers through ~100,000 meters representing a peak load ~7,500 megawatts
- Delivers more than 85,000 MMBTU of gas per day in Western markets
- Provides supply service to ESCO's and billing & data management services to all active Community Choice Aggregators ("CCA's") in California
- Owned by America's largest natural gas and geothermal electricity producer with nearly 26,000 MW of capacity

What is TCC and what does it do?

TCC: Transmission Congestion Contract

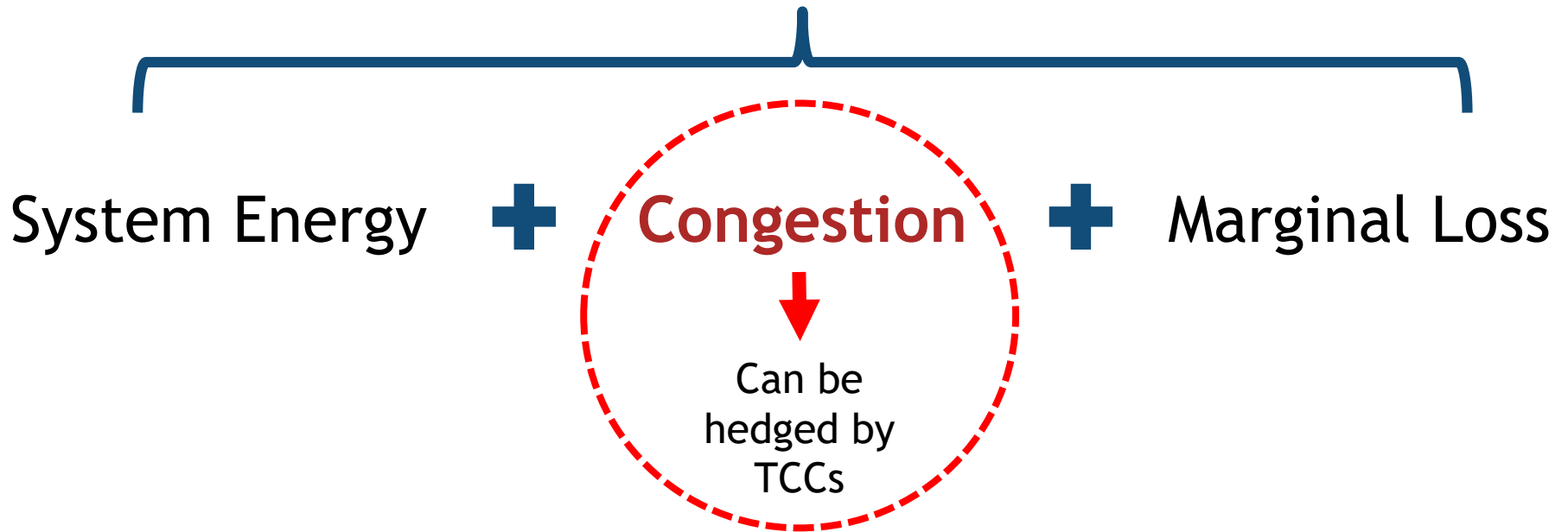
Used by market participants to hedge congestion risk

- TCC is a right to collect Day-Ahead congestion dollars associated with a specific point of injection and a point of withdrawal
 - TCC can also be an obligation to pay DA congestion
- Congestion is a component of Energy Price or LBMP
- LBMP is comprised of system energy, congestion, and marginal loss

Components of LBMP

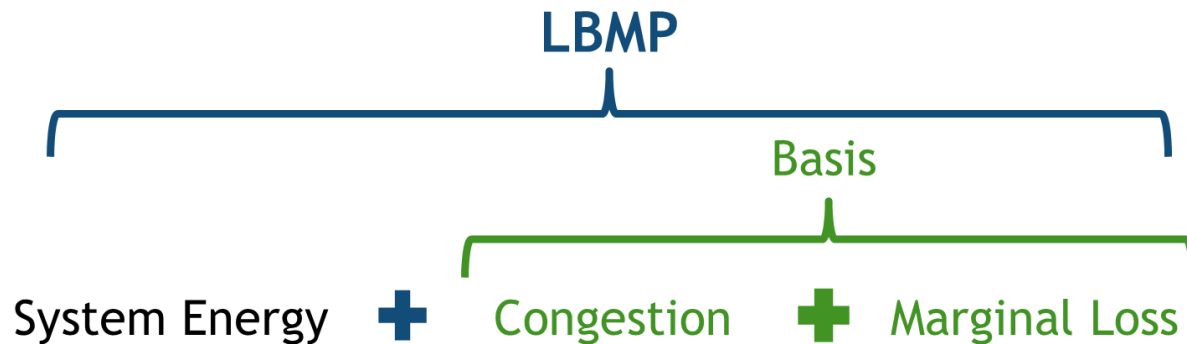
LBMP: Locational Based Marginal Pricing

Cost to provide the next MW of load at a specific location in the grid



LSEs need to fix the Basis between where we buy wholesale electricity supply and deliver to our customer

- Basis is the combination of congestion and marginal loss (two of the three components of LBMP)



- In order for LSEs to be able to provide fully fixed LBMP at the point of withdrawal by the customer, we need to fix energy and basis (congestion + marginal loss)

Who uses TCC's?

TCCs are utilized by:

1. LSEs to directly hedge congestion or indirectly by purchasing Basis from financial intermediaries;
2. Financial intermediaries to hedge the congestion component of Basis, which they market; and
3. Generators to hedge the congestion component of their output

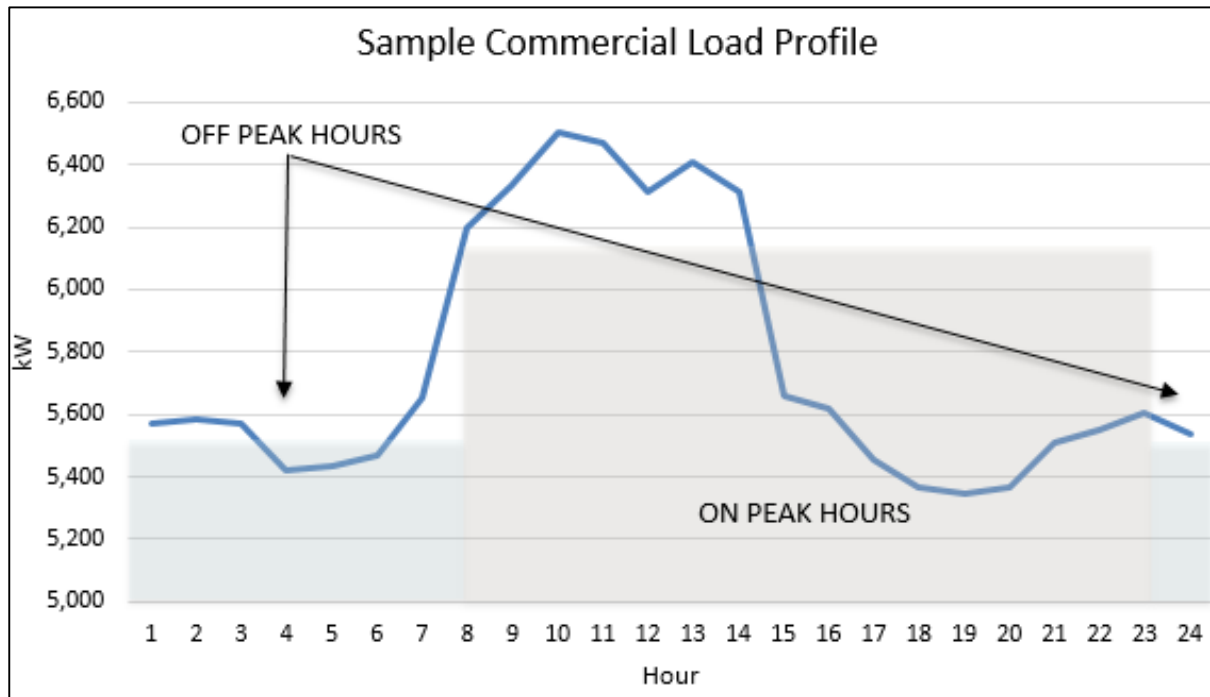
a) Intermittent resources as a share of the generation mix will rise significantly over the next few years due to Climate Leadership and Community Protection Act (CLCPA)

CLCPA Mandates	MW	By
Offshore Wind	9,000	2035
PV Solar	6,000	2025
Energy Storage	3,000	2030

b) Intermittent resources have varying load profiles that will benefit from increased congestion hedging granularity

LSEs also have to manage around the Customer's Load Shape

Shape is the consumption or “Load” variation from hour to hour and month to month. The shape makes the price for each consumer unique.



On Peak Hours:
7 am thru 11 pm
Monday thru Friday

Off Peak Hours:
Overnight, Weekends and
Holidays

Creating the On Peak and Off Peak TCC product provides significant benefits

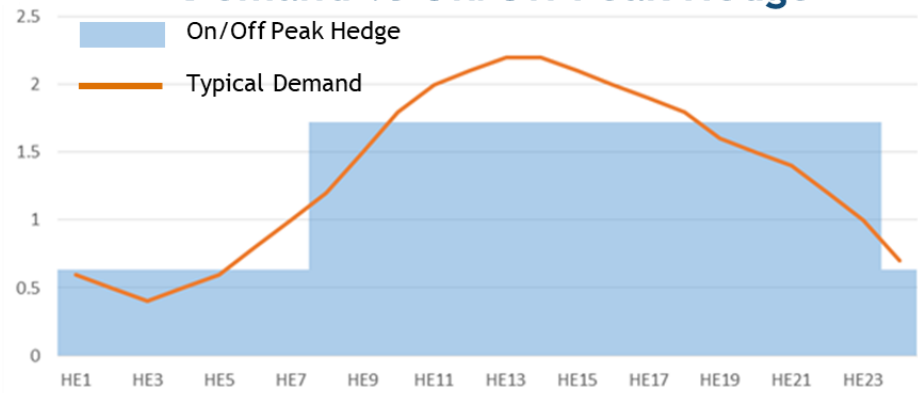
The NYISO currently only offers a 24-hour TCC

1. Reduces the cost of hedging congestion:
 - a) Better aligns congestion hedges with load (and generation) profiles, which reduces cost; which in turn
 - b) Reduces collateral cost and pre-payment obligations for TCC holders that don't wish to hold a 24-hour TCC

Demand vs 24-hr Hedge



Demand vs On/Off Peak Hedge



Creating the On Peak and Off Peak TCC product provides significant benefits (cont.)

Creating On Peak and Off Peak TCCs *decrease* cost of hedging congestion and potentially *increase* TCC auction revenue

2. Could increase TCC auction revenue by
 - a) Better aligning transmission outages and topology with actual system conditions (temporally) thereby increasing available transmission capacity and decreasing revenue deficiency
 - b) Potential modeling improvements would need to be further studied by the NYISO
3. Increases market transparency by providing further granularity
4. Benefits are garnered without adding incremental risk to the system

NYISO would need to break out the current 24-hour TCC into On Peak and Off Peak

- On Peak is defined as HE8 to HE23 (7am to 11pm), Monday through Friday, excluding holidays, commonly known as 5x16
- Off Peak is defined as all other hours, commonly referred to as “Wrap”
- The existing 24-hour (or ATC, “Around-the-Clock”) TCC can be eliminated or retained, as preferred by stakeholders

Today

- 24-hour TCC

With On/Off Peak TCCs

1. 24-hour TCC
2. On-Peak TCC
3. Off-Peak TCC

or

1. On-Peak TCC
2. Off-Peak TCC

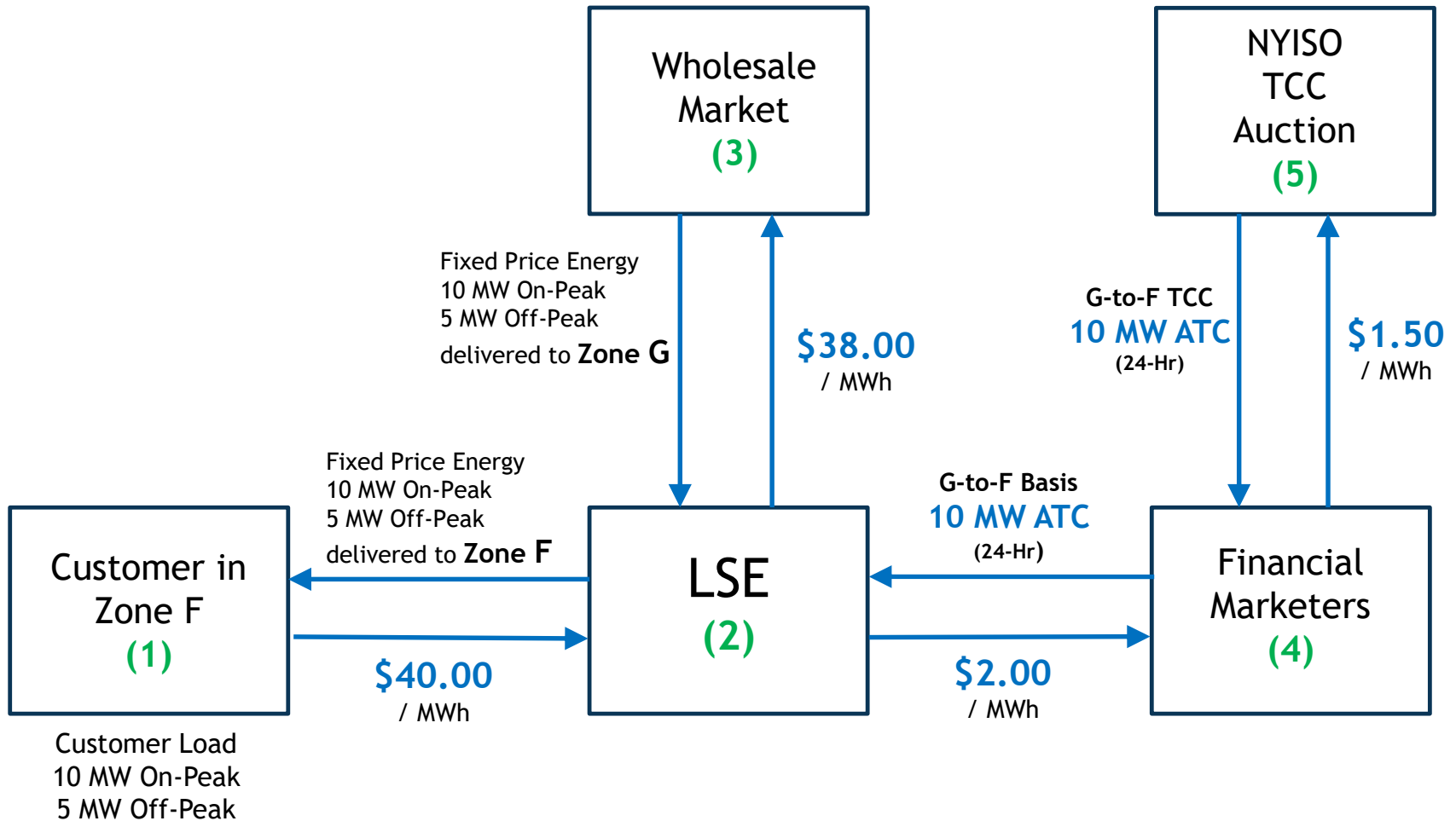
EXAMPLE

How hedging congestion with On Peak & Off Peak TCCs will save the customer cost of electricity supply

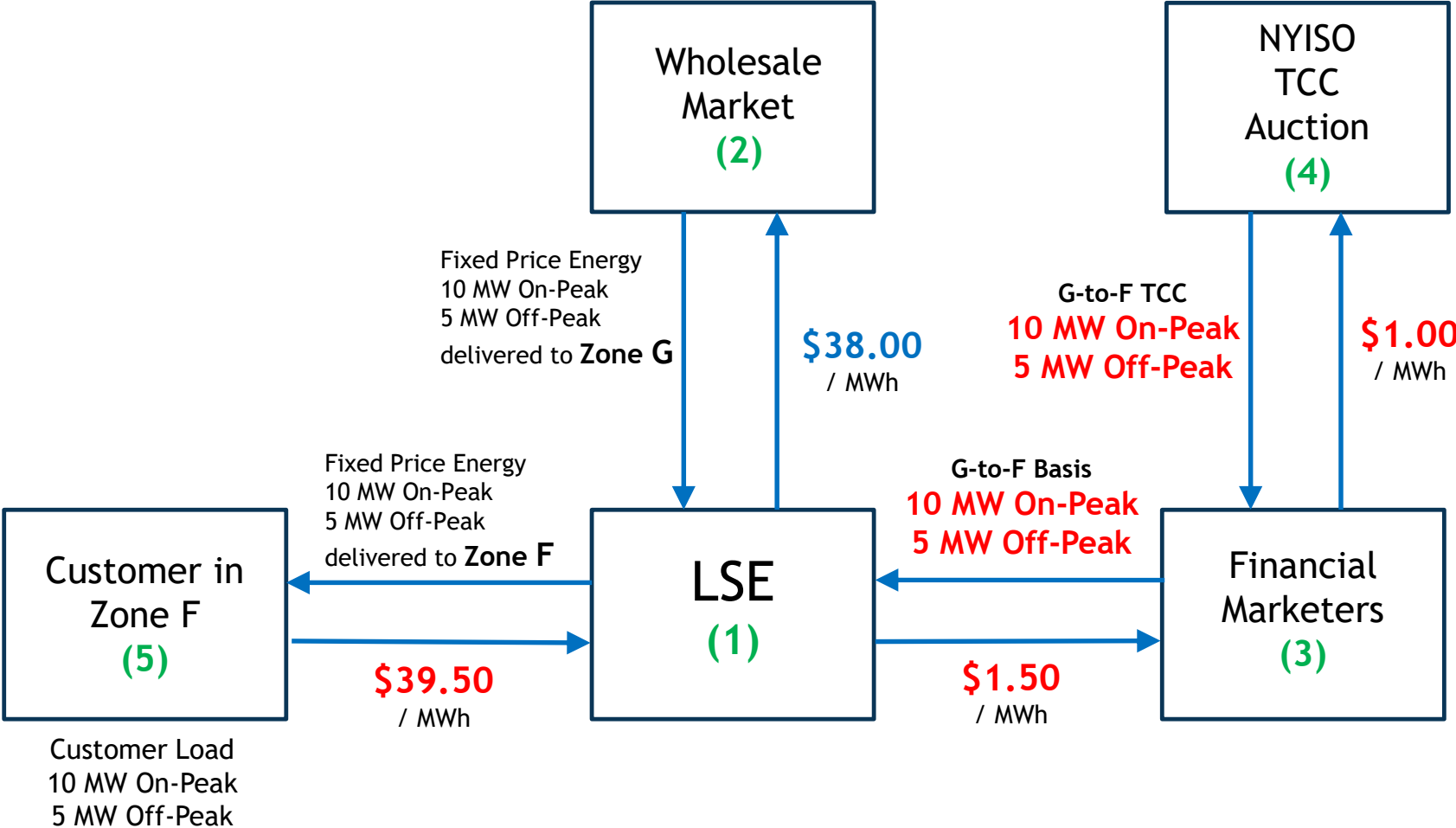
How an LSE hedges its Basis

- LSEs typically purchases energy from the wholesale market delivered to Zones G,J, and A, which are the most liquid
- LSEs then hedge the Basis Risk—*the difference between Zone where we take delivery of the energy to the Zone where we deliver to our Customer*—by purchasing TCCs (and hedging marginal loss ourselves) or Basis from financial marketers

How an energy supply transaction is hedged today



How an energy supply transaction would be hedged with On Peak and Off Peak TCCs



Work with NYISO to develop On/Off Peak TCC project implementation timetable

April-May 2020: Confirm project

2021: Begin design and development of products

Actual implementation timeline will be developed with NYISO



For questions please contact Jung Suh at jung.suh@calpinesolutions.com