


Splight

*Next-generation, software forward
Grid Enhancing Technology*





Digital AAR+DLR (DDLRL)

Digital AAR+DLR (DDLR): Using a Digital Twin

Weather Data



Weather Input Includes

- Temperature (AAR/DLR)
- Wind Speed (DLR)
- Wind Direction (DLR)
- Net Irradiance (DLR)

Operations Data



Operations Input Includes

- Voltage (DLR)
- Current (DLR)

Network Model Data



Network Model Input Includes

- Conductor type
- Tower GeoLocation
- Span Sag / Bundles
- Transformers/Switches etc

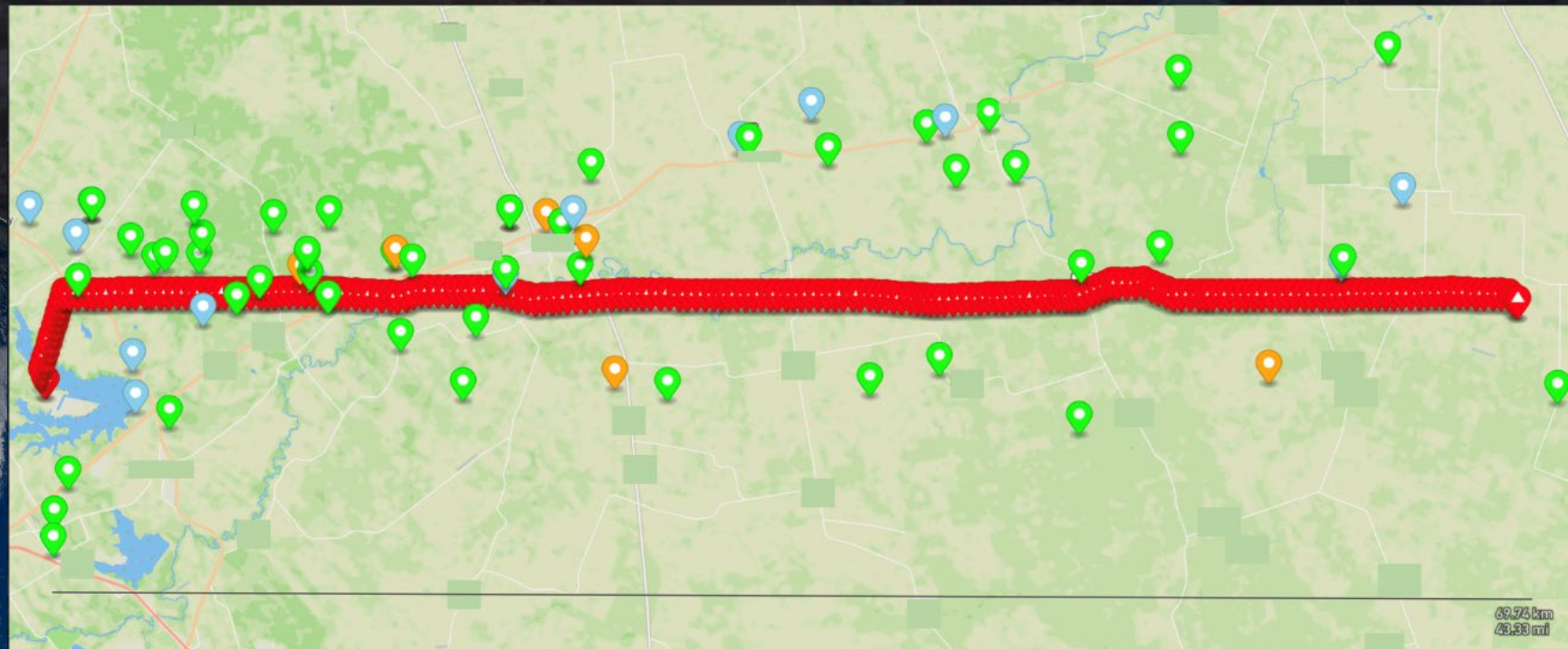
Output

AAR and DLR
Adjusted Ampacity

Conductor Temperature

Digital AAR+DLR (DDLR): IBM, The Weather Company

Observations mostly come from weather stations, weather balloons, radars, ships and buoys, and satellites from more than 100,000 stations in 180 countries and territories.



Splight

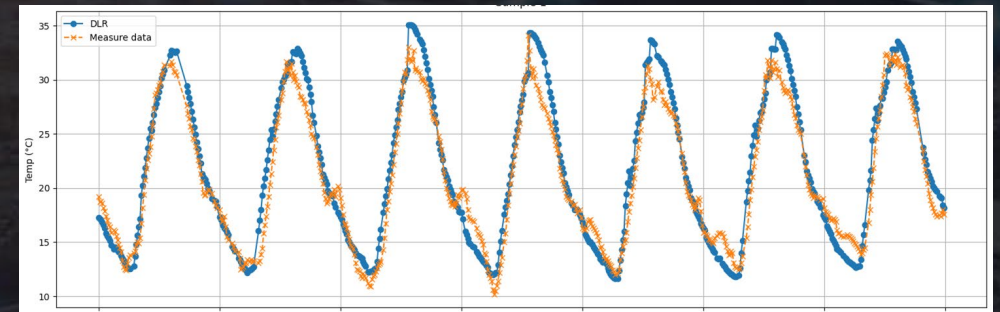
Digital AAR+DLR (DDLAR): Validation

Side-by-side comparison of the Splight system vs. sensor-based line ratings

Splight + IBM Weather Service + Real-Time Data Stream of Line Operations Data

MAE (Mean Average Error): 2.54 °C

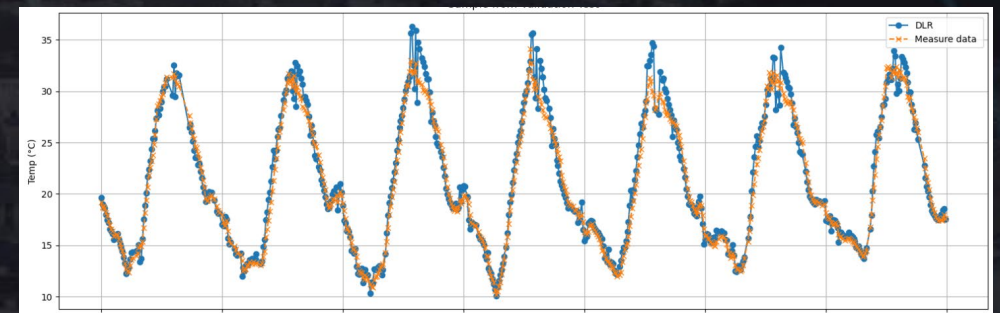
MAPE (Mean Absolute Percentage Error): 2.52 %



Splight + IBM Weather Service + Real-Time Data Stream of Line Operations Data + Supplemental Weather Station

MAE (Mean Average Error): 1.11 °C

MAPE (Mean Absolute Percentage Error): 1.24 %

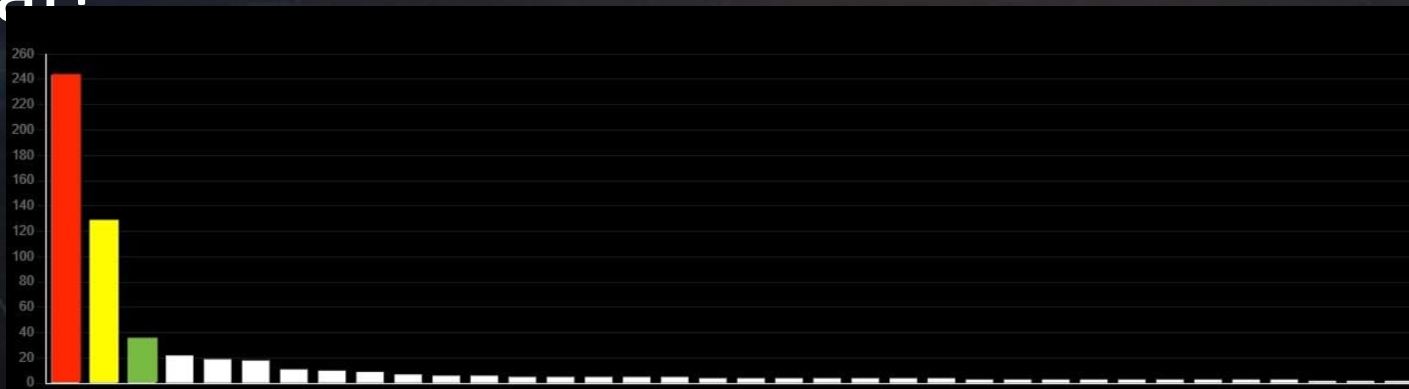


Digital AAR+DLR (DDLR):

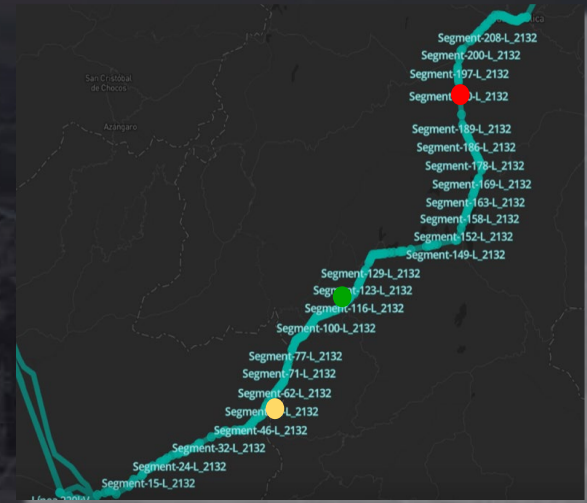
Which span is the constraint in each time interval?

interval?

Constraint Count



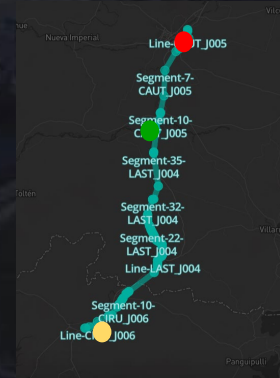
Individual Spans: System A



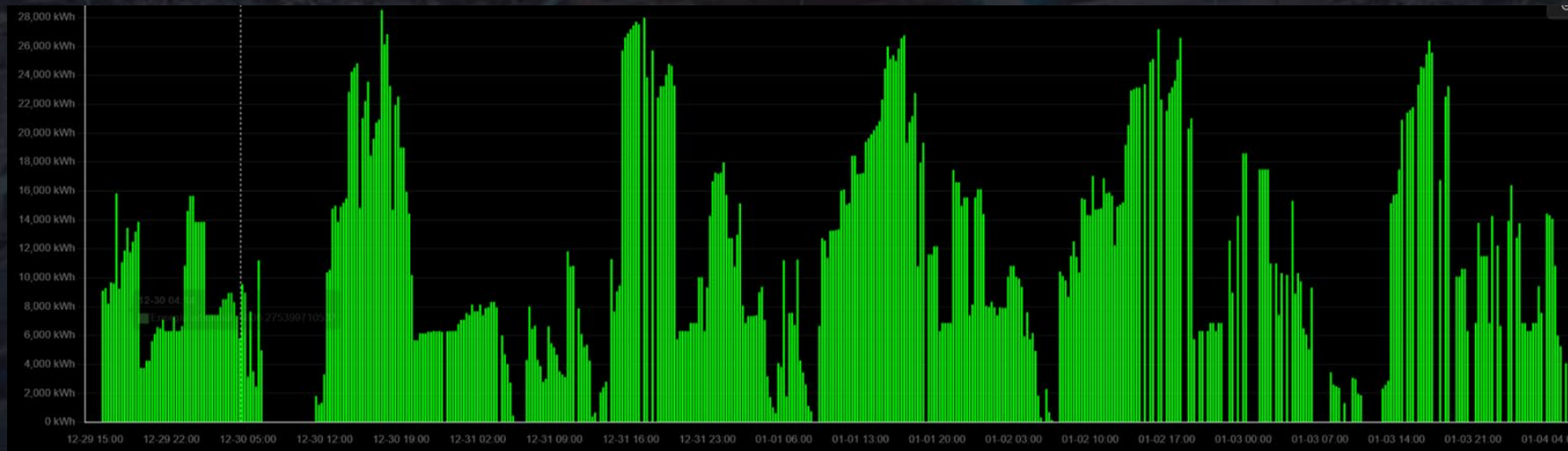
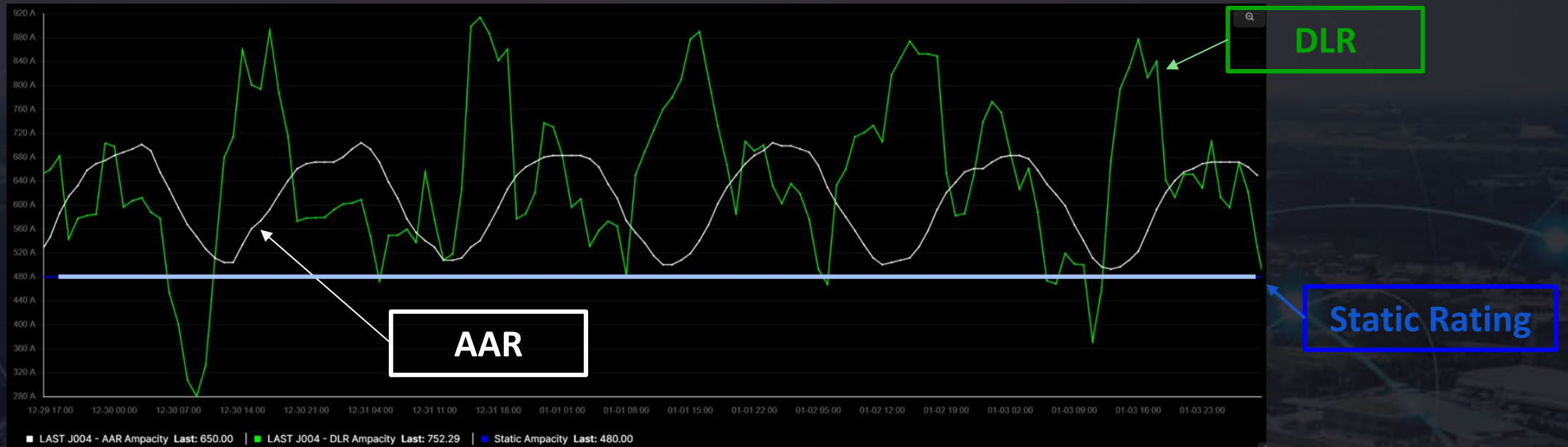
Constraint Count



Individual Spans: System B



AAR, DLR, and Energy Transfer

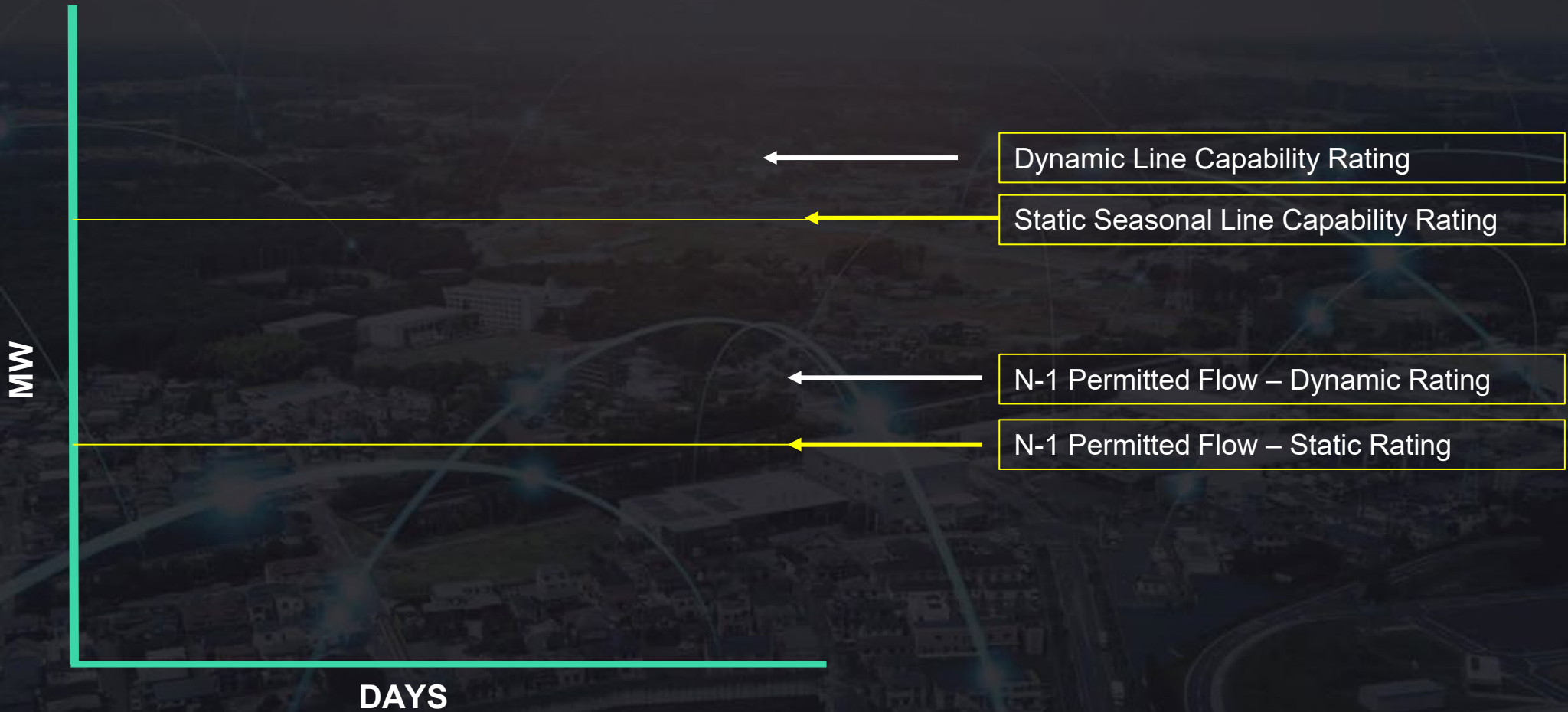


Additional Energy (above seasonal rating)

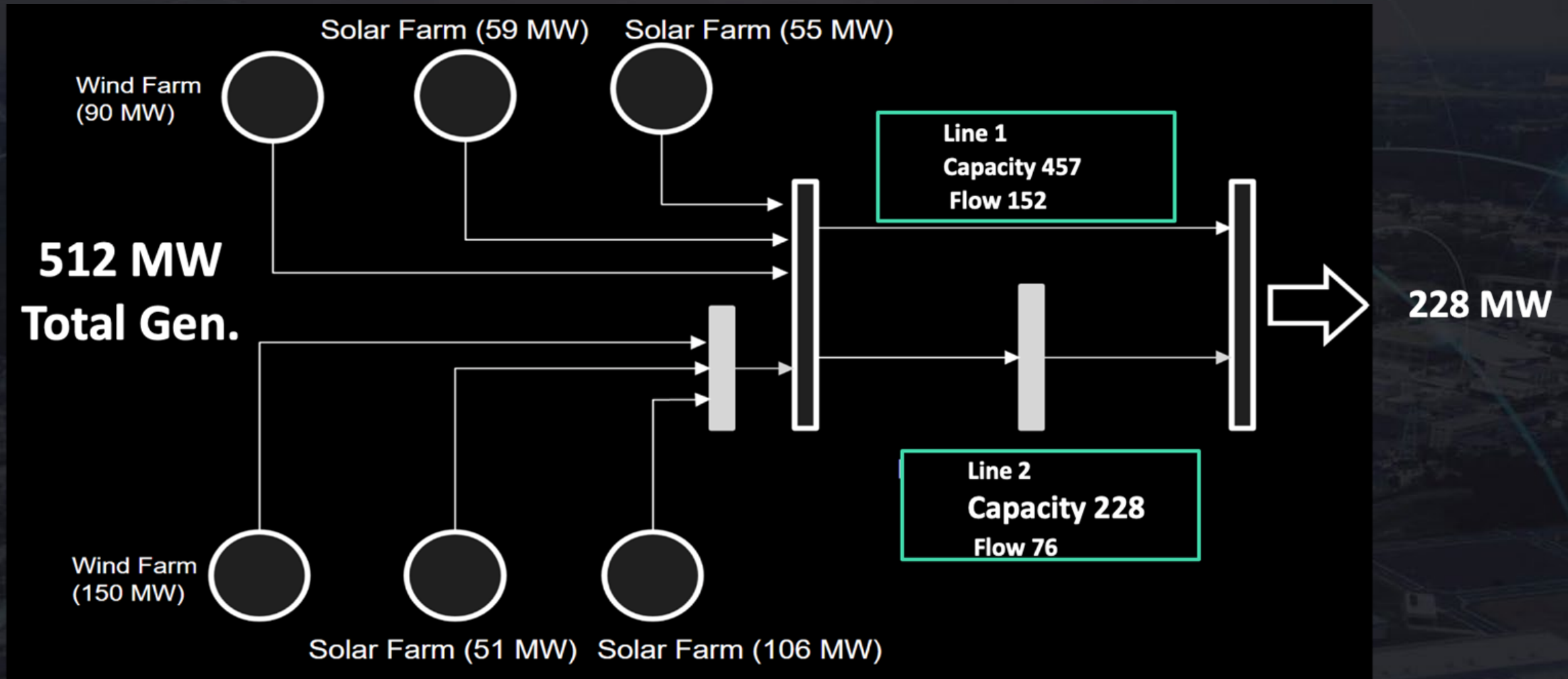
An aerial view of a city at night, with a network of glowing blue lines and nodes overlaid on the buildings and streets, suggesting a digital or data network.

Dynamic Contingency Management (DCM)

Dynamic Line Rating Impact in Practice



Transmission Capability based on N-1 Operating Criteria



Impact on Grid Utilization of N-X Operations Approach

SOLSTICE7A

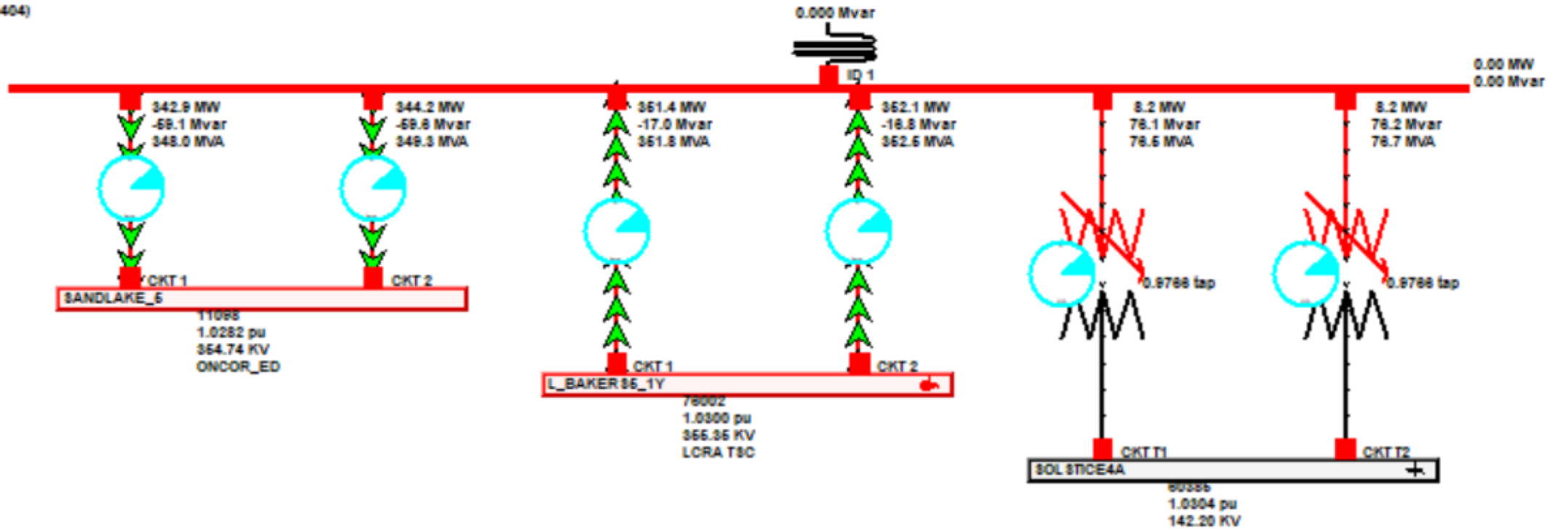
Bus: SOLSTICE7A (60404)

Nom kV: 345.00

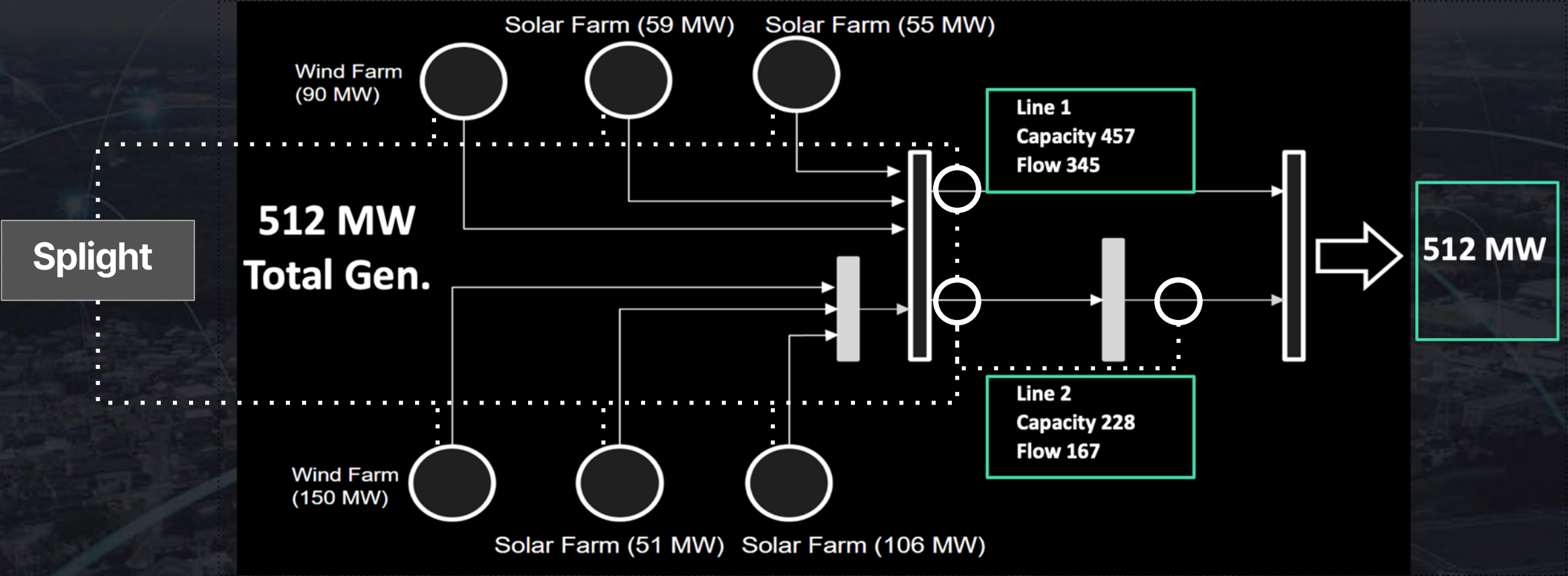
Area: AEP_TNC (8)

Zone: PECOS (434)

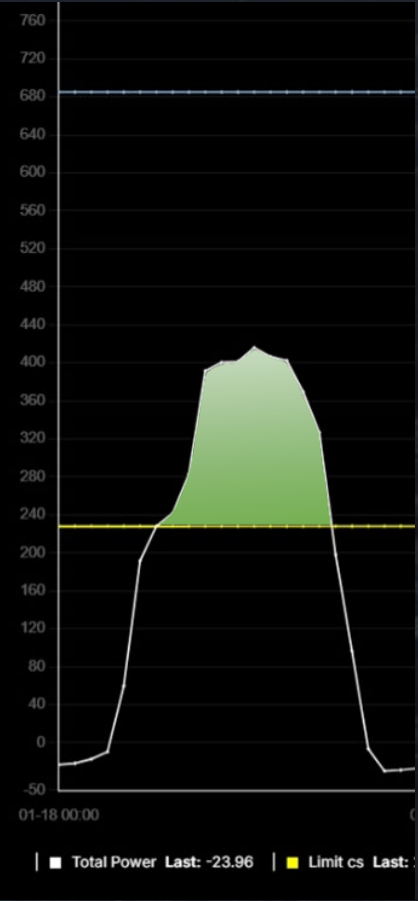
1.0221 pu
362.84 KV
1.81 Deg
Not Valid \$/MWh



DCM: Increasing Transmission Capability



DCM: Results



Energy Limit POST Splight DCM (685MW)

Additional Energy with DCM (up to 512MW)

Static Seasonal Limit

Renewable Power Flow