Central Hudson
2020 DSIP General Information Session

September 21, 2020
Today’s Topics

• 2020 DSIP Overview
• DSP Progress and Plans
• Foundational Investments
• Interconnection Improvements
• Beneficial Electrification & Storage
• Market Coordination
• Information Sharing
• Q&A
2020 DSIP

• Purpose of the Plan and Filing
  – An update from the 2018 Plan
  – Highlight DSP Progress and Plans
  – Provide Information to Regulators
  – Provide Resources for Stakeholders
  – Report Program on a Long Term Vision
2020 DSIP

• Joint Utility Effort
  – Working together to progress the DSP
  – Provides some consistency for developers
  – Develop a common vision
  – Allow for Constant Collaboration

• Individual Effort
  – Continuing on established roadmap
  – Aligning efforts with our system and customer needs
Progressing the DSP

- Continued and Expanded Foundational Investments
- Advancements in Forecasting and Planning
- Interconnection Portal and Hosting Capacity Improvements
- DER Roadmap and ISO Coordination
- Battery Storage
- Preparing for Beneficial Electrification
- Enhancements in Information Sharing
  - System Data Portal
  - Joint Utility Data Page
  - Customer Data Access
5 Year Plan for the DSP

Growing emphasis on large-scale renewables

DSP becomes even more flexible and adaptable

Opening new sources of value for customers and market participants

Expanded customer choice, greater use of DER as system resources, and enhanced access to value streams

DER Integration Services

Market Services

Information Sharing Services

Three interrelated DSP aspects

DSP investments enable management of a more fully integrated grid

Remaining responsive to evolving state objectives (REV, CLCPA) and market dynamics

DSP delivers safe, reliable, efficient, and clean electricity to customers
Capital Plan Highlights – 2021-2025
Current Forecasting Landscape

Peak Demand

- Actual
- Normal
- Forecast
- Adjusted Forecast
Five-Year Investment Plan Development

Inputs → Process → Output

Infrastructure Condition Assessments
Load Forecast Scenarios
Reliability Analysis
DER Interconnections

Area Study/Evaluation of Alternatives

Project Development and Prioritization

Integrated System Plan and Capital Forecast

Guided by:
- Models
- Design Criteria
- Standards
- Transmission Constraints
- Technological Innovation
Key Capital Plan Drivers

Responsible for safe & reliable operation of the electric system

• Daily operational needs
• Compliance requirements
• Maintain reliability
• Forecasted load and DER
• DSP Enablement
• Address aging infrastructure through condition-based replacement programs
## Five-Year Capital Forecast

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>$694</td>
<td>$8,803</td>
<td>$8,704</td>
<td>$4,777</td>
<td>$2,245</td>
<td>$25,224</td>
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<tr>
<td>Transmission</td>
<td>18,581</td>
<td>22,694</td>
<td>31,081</td>
<td>17,313</td>
<td>22,847</td>
<td>112,517</td>
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<tr>
<td>Substation</td>
<td>21,612</td>
<td>14,449</td>
<td>22,358</td>
<td>28,682</td>
<td>14,488</td>
<td>101,589</td>
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<tr>
<td>New Business</td>
<td>7,125</td>
<td>7,262</td>
<td>7,557</td>
<td>8,187</td>
<td>8,263</td>
<td>38,394</td>
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<tr>
<td>Distribution Improvements</td>
<td>38,431</td>
<td>57,855</td>
<td>58,582</td>
<td>57,370</td>
<td>57,249</td>
<td>269,486</td>
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<tr>
<td>Transformers</td>
<td>5,993</td>
<td>6,229</td>
<td>6,485</td>
<td>6,758</td>
<td>7,029</td>
<td>32,493</td>
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<td>Meters</td>
<td>2,787</td>
<td>4,533</td>
<td>4,783</td>
<td>3,431</td>
<td>3,670</td>
<td>19,204</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$95,224</strong></td>
<td><strong>$121,825</strong></td>
<td><strong>$139,550</strong></td>
<td><strong>$126,517</strong></td>
<td><strong>$115,791</strong></td>
<td><strong>$598,907</strong></td>
</tr>
</tbody>
</table>
Five-Year Capital Forecast

- **Non-Discretionary**
  - Restoring service
  - New business
  - Safety repairs
  - Compliance
  - Road Rebuilds/Relocations

- **Maintain System Standards**
  - Equipment replacement based on condition assessment
  - Correct existing planning/design violations (e.g. thermal overload)
  - Equipment replacement based on obsolescence

- **System Enhancement**
  - Provide net financial customer benefit
  - Reduce risk (e.g. upgrades to address predicted future pressure problems)
  - Other justifications

*Value is the calculated depreciation during the 5-year forecast period*
2021-2025 Electric Capital Forecast by Investment Category

5-Year Forecasts

*In Thousands*

- Growth
- Infrastructure
- Compliance
- New Business
- Daily Operations
- Risk Reduction
- Reliability
- Tariff
- Customer Benefit

**2021-2025**
Increasing Hosting Capacity

Capital Infrastructure Projects

- Copper Wire Replacement
- Operating/Infrastructure Programs
- Distribution Automation Program
- Voltage Conversion Projects

Enhanced Monitoring and Control

Battery Storage
Foundation Investment
Grid Modernization
Central Hudson’s Foundational Investment Strategy

Foundational to Core Strategy / Positive Business Case

Foundational to REV

Distribution Automation (DA) - field

Distribution Management System (DMS) - office

NETWORK STRATEGY (NS) (Real-Time Data)

ESRI GIS (Asset Model)
Grid Modernization

- Substation Metering Infrastructure
- Distribution System Operations
- Network Strategy
- Distribution Automation
- GIS System Model
- Advanced Distribution Management System
ESRI GIS Model Cleanup Essential

*Data cleansing still underway*
Distribution Automation (DA)

- Intelligent devices capable of providing 2-way status and control
  - Electronic Reclosers/ Mid Point Ties
  - Switched Capacitors
  - Regulators
  - Monitors & Sensors – to confirm model

- Infrastructure upgrades

- Devices are monitored and controlled by the DMS to complete objectives
Primary Control Center
Central Hudson

Grid Mod Program

6 Integrated Projects over 5 Districts

*Resilient *Reliable *Secure *Affordable *Flexible *Sustainable
Other Investments

• Project Phoenix – Transforming our Customer Information System
  – Existing System Served Customer 30 years
  – Started in 2019 the Company is now underway
  – New System will enable us to meet and react to new State Policies
  – Intended to go live in 2021
Avoided T&D Cost Study
Avoided T & D Cost Study

- Location Specific Transmission and Distribution Avoided Costs Using Probabilistic Forecasting and Planning Methods

1. Clean and fill the data
2. Estimate historical growth
3. Simulate load growth trajectories
4. Estimate T&D costs with and without demand management
5. Time differentiate value
Avoided T & D Cost Study – Key Findings

• Most areas are experiencing declining loads or have ample headroom
• Avoided costs are location/time specific
• Avoided cost estimates reflect uncertainty in forecasts and risk mitigation value of demand management
• Two locations with potential deferral value
• Since the two locations have been classified as NWA solutions – the LSRV and DRV T&D values are zero
Northwest 115kV-69kV Area

Shenandoah Distribution
Capital Planning and NWA Process

1. Integrated System Plan and Capital Forecast
2. NWA MW goals achieved
3. Development of Beneficial Locations for DERs and NWA Solicitations
Interconnection

Stephanie Palmer, Electric Distribution and Standards
Solar PV Penetration Continues to Increase

Cumulative PV MW's Installed by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Existing</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2014</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2015</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>2016</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>2017</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>2018</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>2019</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>2020</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

As of July 31, 2020

<table>
<thead>
<tr>
<th></th>
<th>Interconnected</th>
<th>In Queue</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Systems</td>
<td>9,629</td>
<td>366</td>
</tr>
<tr>
<td>MW</td>
<td>146</td>
<td>200</td>
</tr>
</tbody>
</table>

*NYISO PV queue not included in the chart above - 330 MW*
Non-residential solar is driver of future growth
Key Accomplishments through Stakeholder Collaboration

- Updated NYSSIR screens
- Standardized preliminary screening and CESIR templates
- Material modifications and guidance
- Improvements to ESS and hybrid projects processes
- Developed standard pricing matrices
- Developed secondary network screens to NYSSIR
- Established Inclusion Rules for project queue coordination
Next Steps for Working Groups

- Smart Inverters
- CESIR Analysis Methods
- Reviewing Documentation Requirements
- Cost Sharing Techniques
- Energy Storage Roadmap
## Interconnection Online Application Portal (IOAP)

### Key Functionalities

<table>
<thead>
<tr>
<th>Establishes consistent requirements across NYS</th>
<th>Ability to apply online and automatically manage the application approval process</th>
<th>Improve timeliness for identification of study requirements</th>
<th>Enable transparency into the process</th>
<th>Support the status tracking of times to approval</th>
</tr>
</thead>
</table>

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- Ability to apply online and automatically manage the application approval process
- Improve timeliness for identification of study requirements
- Enable transparency into the process
- Support the status tracking of times to approval
IOAP Project Milestones

- **Phase 1:** Automate the Application Management
- **Phase 2:** Automate SIR Technical Screening
- **Phase 3:** Full Automation of all Processes

**Status:**
- Completed
- In Progress
- Not Started
IOAP Phase 2 – Key Enhancements

Application Improvements
- Request modifications
- Submit additional forms
- Dispatch orders
- Billing orders

Automated Screening
- Links ESRI GIS, IOAP, and DEW
- Automated loadflow analysis upon application submission
Roadmap to Integrated Planning with Distributed Energy Resources (DER)

• Key Tasks and Deliverables
  – Enhance monitoring and control of DERs
  – Continue probabilistic forecasting
  – Improve modeling capabilities
  – Update processes and procedures

• Additional Detail in DSIP Section III.A.
More Information available on our website: www.cenhud.com/dg
Hosting Capacity

Stephanie Palmer – Electric Distribution and Standards
Hosting Capacity: A Tool for Guided PV Deployment

• Development
  – NYS Utilities & Electric Power Research Institute (EPRI)

• Methodology
  – Definition
  – EPRI’s Streamlined Hosting Capacity
  – System Impacts
  – Map display
Hosting Capacity Roadmap

- Stage 1: Distribution Indicators (2016 – Early 2017)
- Stage 2.1: Additional System Data (April 2018)
- Stage 3.0: Advanced Hosting Capacity Evaluations, Sub-feeder level, Existing DER (October 2019)
- Stage 3.1: Downloadable Data and Additional System Data (April 2020)
- Stage 3.X: Additional Enhancements to Advanced Hosting Capacity Evaluations
- Stage 4.X+: Fully Integrated DER Value Assessments

Increasing effectiveness, complexity, and data requirements
Hosting Capacity Maps Today

Central Hudson’s Hosting Capacity Map:  
https://www.cenhud.com/dg

Joint Utilities of NY Website (includes video demonstration):  
http://jointutilitiesofny.org/utility-specific-pages/hosting-capacity/
### Future Hosting Capacity Stages

#### JU Hosting Capacity Analysis Roadmap

<table>
<thead>
<tr>
<th>Stage</th>
<th>Release/Refresh Dates</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 2.1</td>
<td>April 18, 2018</td>
<td>Additional system data, Reflect existing DER in circuit load curves and allocations</td>
</tr>
<tr>
<td>Stage 3.0</td>
<td>October 1, 2018</td>
<td>Sub feeder level hosting capacity, Add incremental feeder level DER installed since HCA refresh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DER included in circuit models as input to HCA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large PV, Other DG (CHP, etc.), Small PV</td>
</tr>
<tr>
<td>Stage 3.1</td>
<td></td>
<td>Additional supporting reference material, Downloadable feeder-level summary data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Annotated circuit notes</td>
</tr>
<tr>
<td>Stages 3.2 – 4.0</td>
<td></td>
<td>Additional Map Functionality, Increased Refresh Rate, Load Capacity Maps</td>
</tr>
<tr>
<td>Stages 4.X +</td>
<td></td>
<td>HCA for hybrid solar + storage, Upstream substation/bank level constraints, Forecasted Hosting Capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analysis violation criteria transparency, Dynamic hosting capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other enhancements</td>
</tr>
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</table>

[Image of the roadmap showing stages and key features]
Electrification and Impacts
NYS Clean Heat Program (Heat Pumps)
NYS Clean Heat Program

• One-stop shop for Heat Pump incentives
  - Residential & commercial
  - Air Source & Ground Source Heat Pumps
  - Heat Pump Water Heaters & Custom measures

• One incentive structure consistent across the State.
  - Same qualifying technology, customers, and building sectors
  - Only rebate *amounts* may differ by utility

• Central Hudson is projecting to install approximately 12,000 heat pumps between 2020 and 2025.
## Typical Project Examples

<table>
<thead>
<tr>
<th>Mini-Split</th>
<th>Ducted ASHP</th>
<th>Geothermal</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Mini-Split Image" /></td>
<td><img src="image2.jpg" alt="Ducted ASHP Image" /></td>
<td><img src="image3.jpg" alt="Geothermal Image" /></td>
</tr>
<tr>
<td>• Two Units/Zones</td>
<td>• Two Units/Zones</td>
<td>• Single Unit</td>
</tr>
<tr>
<td>• Partial Load</td>
<td>• Full Load</td>
<td>• Full Load</td>
</tr>
<tr>
<td>• $6,500 Total Cost</td>
<td>• $14,000 Total Cost</td>
<td>• $25,000 Total Cost</td>
</tr>
<tr>
<td>• $1,400 Incentive</td>
<td>• $5,900 Incentive</td>
<td>• $9,100 Incentive</td>
</tr>
<tr>
<td>• $5,100 Net Cost</td>
<td>• $8,100 Net Cost</td>
<td>• $15,900 Net Cost</td>
</tr>
</tbody>
</table>
Electric Transportation
Forecasted Levels and Impacts

- Market forecasts are currently between 9,400 and 16,500 BEVs in the service territory by 2025.
- Levels of EV adoption do not significantly impact utility system planning scenarios and related distribution system investment plans.
- Also performed “Pressure Test” scenarios to stress the system under higher levels of EV
## Forecasted Levels and Impacts

<table>
<thead>
<tr>
<th>Year</th>
<th>Scenario 1</th>
<th></th>
<th></th>
<th>Scenario 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EVs</td>
<td>PHEVs</td>
<td>BEVs</td>
<td>EVs</td>
<td>PHEVs</td>
<td>BEVs</td>
</tr>
<tr>
<td>2020</td>
<td>3,799</td>
<td>1,809</td>
<td>1,990</td>
<td>4,627</td>
<td>2,091</td>
<td>2,536</td>
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<tr>
<td>2021</td>
<td>4,626</td>
<td>2,037</td>
<td>2,589</td>
<td>6,414</td>
<td>2,590</td>
<td>3,824</td>
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<td>2022</td>
<td>5,613</td>
<td>2,238</td>
<td>3,375</td>
<td>8,474</td>
<td>3,024</td>
<td>5,451</td>
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<td>2023</td>
<td>6,698</td>
<td>2,347</td>
<td>4,352</td>
<td>10,752</td>
<td>3,310</td>
<td>7,442</td>
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<tr>
<td>2024</td>
<td>7,976</td>
<td>2,410</td>
<td>5,566</td>
<td>13,475</td>
<td>3,520</td>
<td>9,955</td>
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<tr>
<td>2025</td>
<td>9,433</td>
<td>2,476</td>
<td>6,957</td>
<td>16,550</td>
<td>3,732</td>
<td>12,818</td>
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<tr>
<td>2026</td>
<td>11,087</td>
<td>2,560</td>
<td>8,527</td>
<td>20,016</td>
<td>3,982</td>
<td>16,034</td>
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<td>2027</td>
<td>12,934</td>
<td>2,661</td>
<td>10,274</td>
<td>23,866</td>
<td>4,264</td>
<td>19,602</td>
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<td>2028</td>
<td>14,981</td>
<td>2,772</td>
<td>12,209</td>
<td>28,113</td>
<td>4,568</td>
<td>23,545</td>
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<td>2029</td>
<td>17,208</td>
<td>2,901</td>
<td>14,306</td>
<td>32,717</td>
<td>4,906</td>
<td>27,811</td>
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<td>2030</td>
<td>19,615</td>
<td>3,049</td>
<td>16,567</td>
<td>37,681</td>
<td>5,281</td>
<td>32,401</td>
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</tbody>
</table>
Central Hudson Storage Integration
CH Current Progress

• Storage RFPs & NYSERDA Roadmap
• Quanta - NYSERDA Energy Storage System Analysis Project
• SUNY New Paltz PV + Battery Storage Research Project **
• Quanta BESS Study
• Four Corners Microgrid **
Elting Gym

Battery/Inverter
Four Corners Microgrid Project

• Battery storage can pick up the entire load while the 2 MW generator ramps up to speed.
• Battery storage can engage in under 1 cycle allowing option for seamless transition to island mode.
• Option to use Battery storage during parallel mode for Grid support services.
• Battery storage can be increased to meet future demands.
Distribution Battery Storage Capacity Forecast w/ 95% Confidence Interval
Market and Operations Coordination
Non-Wires Alternatives (NWA)

North West Area
10MW

Merritt Park
1MW

Shenandoah/Fishkill Plains
5MW
## NWA Capacity by Load Zone

<table>
<thead>
<tr>
<th>Load Zone</th>
<th>Residential &amp; Small Commercial</th>
<th>Large C&amp;I</th>
<th>Targeted Energy Efficiency</th>
<th>Avoided Line Losses</th>
<th>Total kW Available</th>
<th>% of Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishkill/Shenandoah</td>
<td>2,901</td>
<td>80</td>
<td>524</td>
<td>171</td>
<td>3,676</td>
<td>75%</td>
</tr>
<tr>
<td>Merritt Park</td>
<td>330</td>
<td>950</td>
<td>6</td>
<td>54</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Northwest Corridor</td>
<td>1,388</td>
<td>4,167</td>
<td>1,543</td>
<td>247</td>
<td>7,345</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,619</strong></td>
<td><strong>5,197</strong></td>
<td><strong>2,073</strong></td>
<td><strong>472</strong></td>
<td><strong>12,020</strong></td>
<td></td>
</tr>
</tbody>
</table>
### NWA Suitability Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Potential Elements Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Type Suitability</strong></td>
<td>Project types include Load Relief and Reliability*. Other categories currently have minimal suitability and will be reviewed as suitability changes due to State policy or technological changes.</td>
</tr>
<tr>
<td><strong>Timeline Suitability</strong></td>
<td><strong>Large Project</strong> 36 to 60 months</td>
</tr>
<tr>
<td></td>
<td><strong>Small Project</strong> 18 to 24 months</td>
</tr>
<tr>
<td><strong>Cost Suitability</strong></td>
<td><strong>Large Project</strong> ≥ $1M</td>
</tr>
<tr>
<td></td>
<td><strong>Small Project</strong> ≥ $300k</td>
</tr>
</tbody>
</table>

*Reliability projects entail projects for remote single source regions or customer requested enhanced reliability projects (i.e., redundant supplies).
Dynamic Load Management Programs

- Commercial System Relief Program
  - 8,213 kW enrolled
  - Events dispatched at 97% forecasted peak
  - 25 participants

- “Term” DLM
  - Standard & Auto categories
  - Higher performance requirements
  - Multi-year contracts beginning in 2021
  - RFP to be released pending Commission Order
NYISO Market and Operation

- CH along with the Joint Utilities have been working continuously with the NYISO
- Helped formulate the market proposals
- Dual participation of distribution sited resources
- Coordinate interconnection processes
- Coordinate operating processes
Central Hudson DSIP – Information and Data Sharing
System Data Sharing

• Capital Investment Plans
• Reliability Statistics at the circuit level;
• Hosting Capacity Maps;
• 5 year Load Forecasts - 8760 by substation;
• Historical Load Data - 8760 by circuit, substation, and transmission area;
• NWA Opportunities and Maps;
• Queued and installed DG; and
• SIR Pre Application Information.
System Data Portal
Customer Data Sharing

- **NYSERDA / Utility Energy Registry (UER)**
  online platform designed to offer streamlined public access to aggregated customer load data, segmented by customer type and by municipality

- **Pilot Integrated Energy Data Resource**
  incorporates customer and system data which developers can use to identify, evaluate and initiate DER development opportunities

- **Green Button Download**
  limited due to lack of AMI at scale

- **Strategic Use of Energy Related Data**
  (Case 20-M-0082) comprehensive and unified forum to address data access and availability of energy-related data

Continued emphasis on privacy and cybersecurity is an integral part of these efforts.
Thank You