Large Load Demand Flexibility: What We're Seeing in Other Markets

Large Load Flexibility Precedents and Their Limited Applicability in Virginia

9/18/26

***Note**: this deck covers materials presented to stakeholders at session 1 of the Large Load Demand Flexibility Stakeholder Working Group. The materials have been updated to improve clarity for those who did not attend the working group*

Context and Content

What Dominion has benchmarked and why

Context

- As per SB 371 / HB 284, Dominion Energy Virginia must file a **voluntary demand flexibility program(s) for large load customers** by January 15th, 2027.
- To inform the process, Dominion Energy Virginia has **benchmarked large load demand flexibility (LLDF) initiatives** across the US and beyond.
- This deck **summarizes the findings** from these benchmarking efforts

This deck:

1. Groups LLDF initiatives progressing across the US into **four categories**
2. Considers each category in detail to demonstrate why **there is no off-the-shelf precedent for Dominion** to use when designing its LLDF program(s) in response to SB 371 / HB 284
3. Explores lessons Dominion can take from the solutions used by **The Netherlands** to ameliorate its locally congested transmission and distribution grids

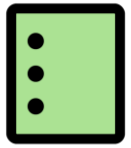
Summary: Dominion's LLDF program will be a unique effort—there is no off-the-shelf program precedent

Dominion Zone is uniquely locationally challenged

Most programs and initiatives focus on system emergencies related to peak loads, ***not local congestion relief***

Most initiatives of relevance are newly announced

Lots of relevant proposals and new programs, but *no established success stories to emulate*



SB 371 / HB 284 has a unique set of requirements

More complex than other programs due to provisions like no carbon emitting capacity, Capacity Reduction Credits, etc.

Large load flexibility is a fast-evolving space

We considered initiatives spanning four key areas – none provide a strong precedent for our LLDF program

	Data center flexibility initiatives	Utility VPPs[1] and DR programs	Non-firm connections	New legislative programs
What	Data center load flexibility pilots and VPP agreements	New and established VPPs and DR programs for large loads	Emerging non-firm connection precedents for large loads	Relevant programs newly legislated for by States
Maturity[2]	*Fast-emerging*	*Widespread*	*Fast-emerging*	*Not implemented*
Applicability to System Peak	*Almost always*	*Almost always*	*Almost always*	*Almost always*
Applicability to Local Congestion	*In limited cases*	*In limited cases[3]*	*Program dependent*	*None explicitly*

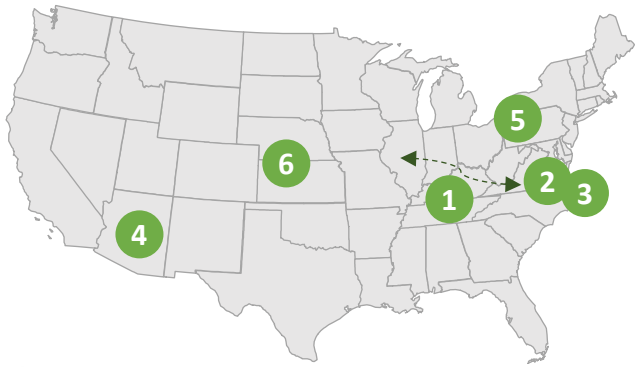
Let's explore each in turn to understand why there is no off-the-shelf precedent for Dominion's LLDF program

[1] Virtual Power Plants; [2] Relative maturity in the United States; [3] VPP programs typically only focus on local congestion at the Distribution level. More traditional demand response programs very rarely focus on local congestion in the US.

Data center flexibility

Promising solution base could accelerate interconnections if congestion relief capabilities can be proven

Relevant examples



1	**Spatial load shifting** between data centers in IL & VA
2	96 MW scaled **power-flexible data center** being built
3	**Inference load flex** innovation pilot
4	**Load reduction demonstrations**, for instance 25% reduction at center in AZ for three hours
5	**PJM-wide 'BYOC' VPP** between Google and Voltus, 100 MW DER capacity
6	**US-wide VPP** for large load flexibility by Tesla, SunRun, Renew Home (up to 16 GW)

Analysis: Relevance for Dominion LSE's LLDF program

Maturity:

- Growing portfolio of on-site flexibility capability pilots, though scale up is required.
- Large load VPP initiatives are newly announced.

System Peak Applicability:

- Both onsite flexibility and VPPs highly applicable to address capacity adequacy emergencies

Local Congestion Applicability:

- *VPP agreements* more suited to **system-wide** reductions unless procurement is explicitly locationally targeted.
- *Flexing capabilities* suited to **local congestion relief**, but can only prevent curtailment in worst instances if able to be sustained for longer time periods

Utility VPPs and DR programs

Utility VPPs typically not explicitly linked to large loads. Most large load tariffs do not have demand flexibility provisions

Relevant examples[1]

DR programs for large loads
- Con Edison CSRP, DLRP
- Nat. Grid ConnectedSolutions
- Idaho Power Flex Peak Program

Utility VPP programs
- DEV
- NJ BPU VPP
- APS
- GMP BYOD
- PSE
- PG&E
- Xcel AVPP
- Xcel utility-owned (MN)
- CPS Energy

Large load tariffs (*Non-interruptible)*
- Dominion GS-5
- FPL LLCS
- Duke Energy TT
- Xcel Energy LGTOD
- Kentucky Utilities EHLF

Analysis: Relevance for Dominion's LLDF program

Maturity:
- DR programs widespread, *but incentives are not aligned with what new large loads require*
- Utility VPPs proliferating, *but not linked to large loads*
- Large load tariffs proliferating, *but typically not linked to flexibility*

System Peak Applicability:
- DR programs and VPPs highly aligned

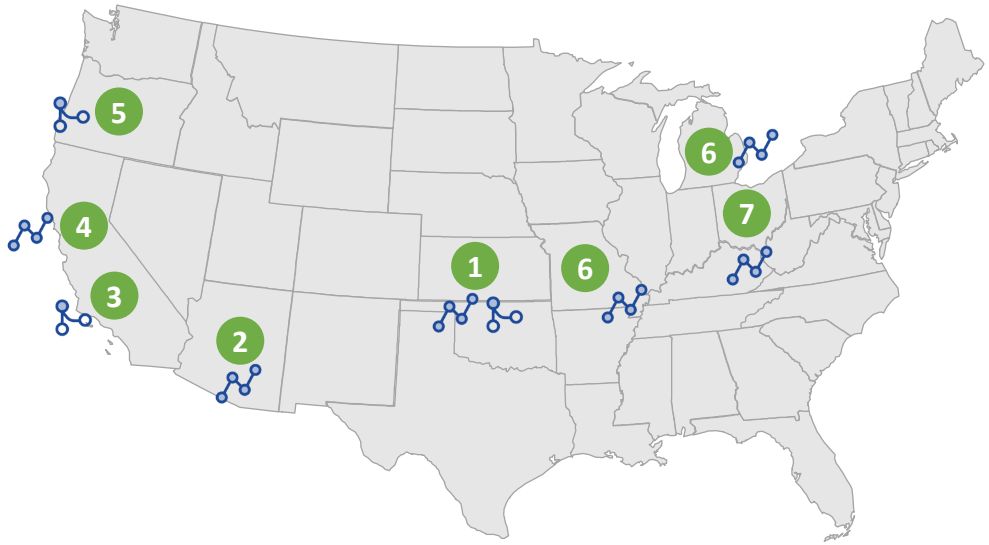
Local Congestion Applicability:
- *VPPs* more locationally targeted at distribution level
- *DR programs* and *tariffs* typically focused on system emergencies

[1] Non-exhaustive

Non-firm connections (1/2)

Growing number of interruptible tariffs and agreements. Some enable accelerated interconnection.

Relevant Examples



KEY

- Local Congestion Relief
- System Peak Relief

1. ***SPP's CHILLS Program:*** **Non-firm transmission service. Accelerated connection for qualifying large loads in return for emergency curtailment.** Full firm within 7 years
   Caveat: New service, unclear how much uptake
2. ***APS XHLF Tariff:*** Large loads get $/kW credit if APS can control load at short notice
   Caveat: Only incentive is financial, only used for system peak events
3. ***PG&E's Flex Connect:*** Dynamic operating limits connect new *distribution* load quicker
   Caveat: Only demonstrated for smaller loads (EV charging)
4. **SVP FLIP Pilot:** Data centers get expanded grid access for verified flexibility
   Caveat: Announced, no results yet
5. ***PGE Flexibility Initiative:*** AI forecasting & modeling optimizes available capacity to accelerate new large load connections
   Caveat: Best-suited to smaller data centers, case-by-case rather than program
6. ***Consumer Energy Rate GPD, Evergy LLPS Tariff:*** Customers designate interruptible portion of on-peak demand under $ or credit provisions
   Caveat: Only interruptible for system peak events
7. ***AEP Ohio Data Center Tariff:*** Loads can use localized/BTM resource to offset baseline grid capacity obligations, provided it can curtail load to match generation shifts
   Caveat: Only seems appropriate for system peak events

Non-firm connections (2/2)

Limited precedence for transmission congestion relief. Programs and initiatives are immature

Analysis: Relevance for Dominion's LLDF Program

Maturity:

- These programs and initiatives are almost all newly announced within last 12 months.

System Peak Applicability:

- Most interruptible load programs are built around provision of system capacity adequacy relief for emergency events

Local Congestion Applicability:

- SPP's CHILLS is the only example of a standardized, non-firm interconnection program providing local *transmission* congestion relief.

New legislative programs

Several States are mandating large load flexibility through various mechanisms, but none have SB 371/ HB 284's focus on local considerations

Examples

1. **New Jersey:** Voluntary CRC-style program with PJM capacity obligation offset incentive
2. **Maryland:** PSC must launch a *voluntary* large load interruptible interconnection service. Limited details – bill language vague
3. **Texas:** Mandated emergency load shedding and **voluntary DR programs** for large loads being developed

Analysis: Relevance for Dominion's LLDF Program

Maturity:

- Relevant legislation passed in 2025 (TX) and 2026 (others) sessions – none of the legislated programs have been stood up

System Peak Applicability:

- NJ and TX programs linked to system emergencies. MD unclear

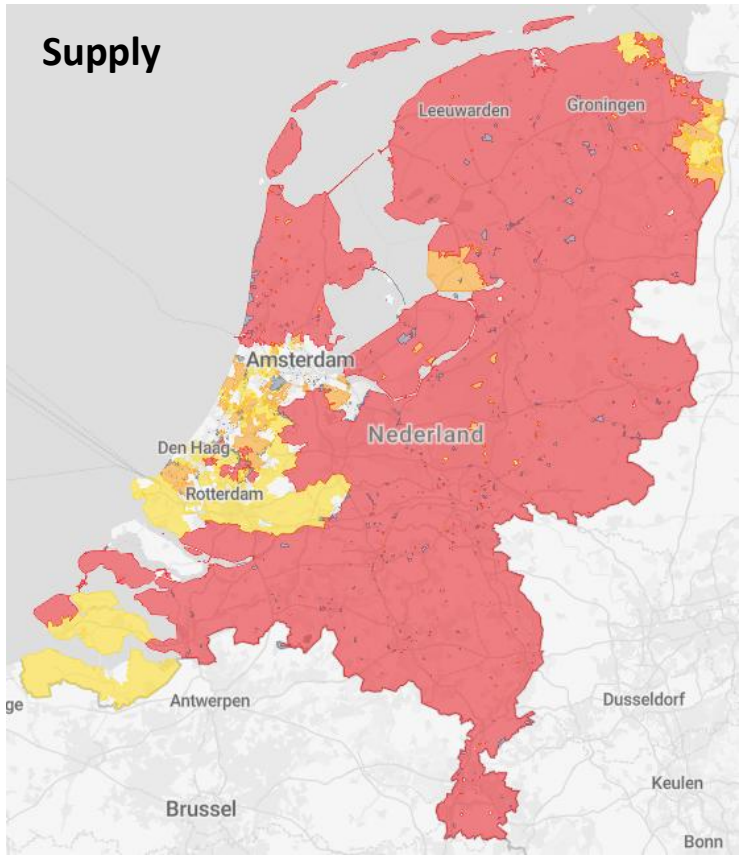
Local Congestion Applicability – Critical Focus:

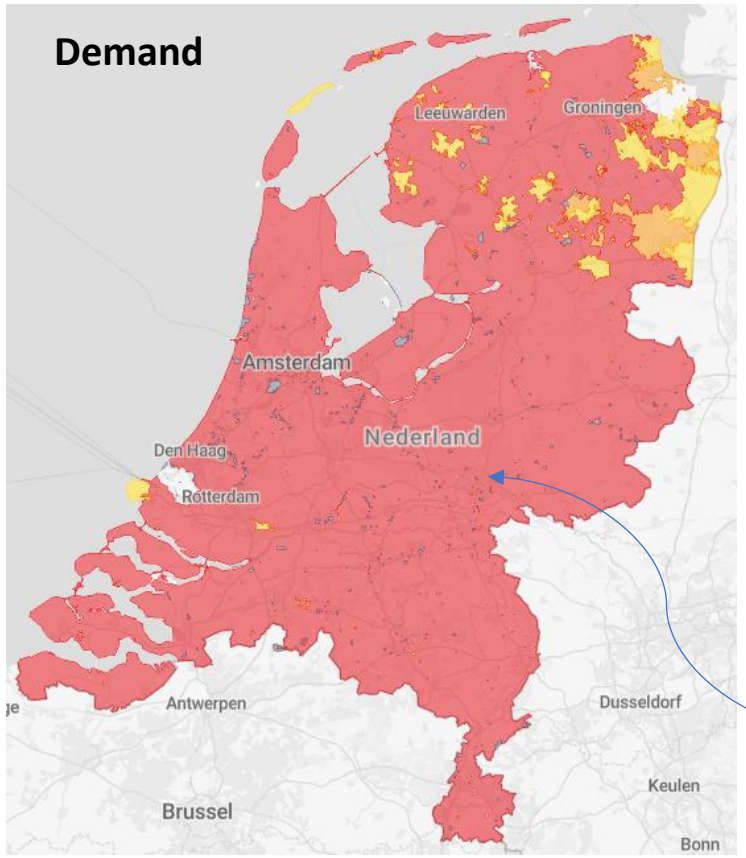
- Only SB 371/ HB 284 makes explicit mention of the consideration of localized solutions for program development

Focus: Congestion in The Netherlands

Dutch grid experiences transmission congestion, so makes for a useful case study

Problem: Dutch grid congestion is severe and worsening





- (Transparent) – No capacity constraints
- Congestion expected
- Congestion pre-announced
- Structural congestion – **new connections refused**

In very congested areas, large loads cannot secure firm connections.

The problem has worsened such that almost the whole country is structurally congested for demand

Focus: Congestion in The Netherlands

Three-pronged solution provides pointers for Dominion's LLDF program

Solutions: Non-firm connections and locationally valued flexibility

1

Non-firm connections: Time Dependent Transport Rights (TDTRs)

- Large loads bypass connection moratoriums in exchange for being fully curtailable for a proportion of hours annually
- 9.1 GW capacity freed up[1] vs 70 GW of applications – high demand!

Lesson: In congested areas, flexible solutions can be highly sought after if designed well

2

Congestion relief: Capacity Steering Contracts (CSCs)

- Customers with CSCs make flexible capacity available and deploy it at agreed times or upon request[2] to prevent congestion
- Will become standard for formalizing congestion management agreements
- Customers paid for both availability and delivery

Lesson: Design flexibility schemes to complement non-firm interconnection

3

Centralized locational signals: GOPACS congestion management platform

- Transmission and distribution operators can procure location-specific flexibility for congestion management on joint platform
- GOPACS also offers resources for loads to secure TDTRs or CSCs
- In most congested areas, market participants must offer available flexibility

Lesson: Transparent and up-to-date data can drive engagement with flexibility programs

[1] Vs 21 GW Dutch peak load; [2] Different CSC types

Appendix: Map of selected LLDF initiatives

Mix of utility-led and third party-led initiatives[1]

OR: **PGE's AI forecasting** unlocks incremental capacity via **on-site flexibility.**

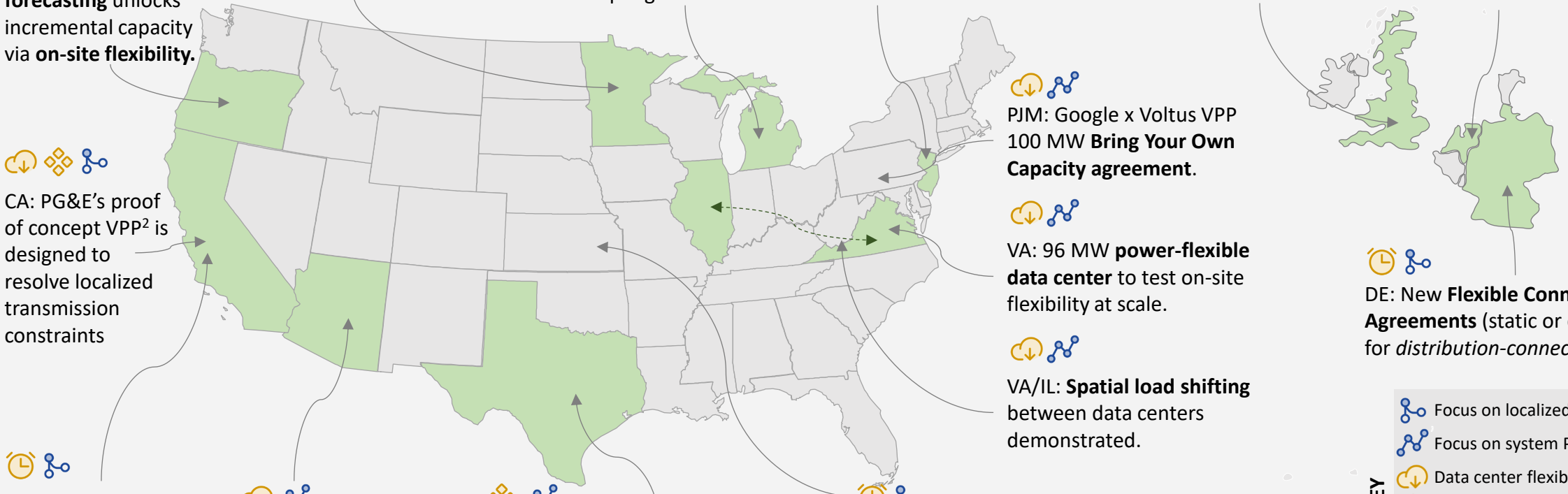
MN: Google funds 1.6 GW renewables and **100-hr 300 MW battery** for Xcel.

MI: Data center developer funds **1.4 GW system-wide batteries**. Utility operates, developer gets revenues.

NJ: Voluntary **CRC-style** program with PJM **capacity obligation offset incentive**.

UK: Widespread *distribution-level* **non-firm connections. Local Constraint Market** for transmission

NL: **Non-firm connections** with 15% hours curtailable. GOPACS *trans*. & *dist*. **local constraint** flexibility market



CA: PG&E's proof of concept VPP[2] is designed to resolve localized transmission constraints

PJM: Google x Voltus VPP 100 MW **Bring Your Own Capacity agreement**.

VA: 96 MW **power-flexible data center** to test on-site flexibility at scale.

VA/IL: **Spatial load shifting** between data centers demonstrated.

DE: New **Flexible Connection Agreements** (static or dynamic) for *distribution-connected* load

CA: PG&E's **Dynamic operating limits** for new *distribution* load to connect quicker.

AZ: Emerald AI pilot **reducing data center load** 25% for 3 hours.

TX: Mandated emergency load shedding and **voluntary DR programs** for large loads being developed.

SPP: HILLGA framework integrated load and gen. studies. CHILLS offers 90-day connection pathway in return for emergency curtailment.

KEY

- Focus on localized constraints[1]
- Focus on system Peak
- Data center flexibility
- Utility VPPs and DR programs
- Non-firm connections
- Custom agreements

[1] Including some not covered at the working group session; [2] Transmission-level unless otherwise stated; [2] Alongside Google, Sunrun, Tesla, Renew Home, Rewiring America, encoord, and other partners

Appendix: Recap of System vs Locational Flex

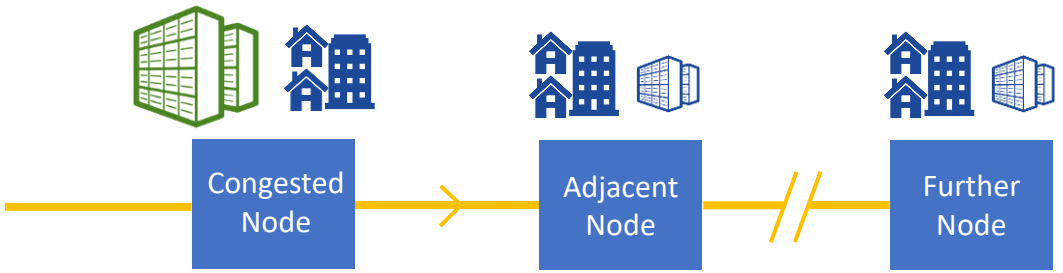
Demand flexibility can provide both system-wide and local congestion benefits

System Peak

Demand response from **any part of Dominion LSE** can help support generation capacity adequacy

Localized Transmission Availability

Only demand flexibility from **electrically proximate resources** can help address local transmission congestion



Demand flexibility **may help to relieve congestion**

Demand flexibility **may not help to relieve congestion**