

LADWP x Cleantech Academy Final Presentation

Felix Peng

Power New Business and Electrification Division

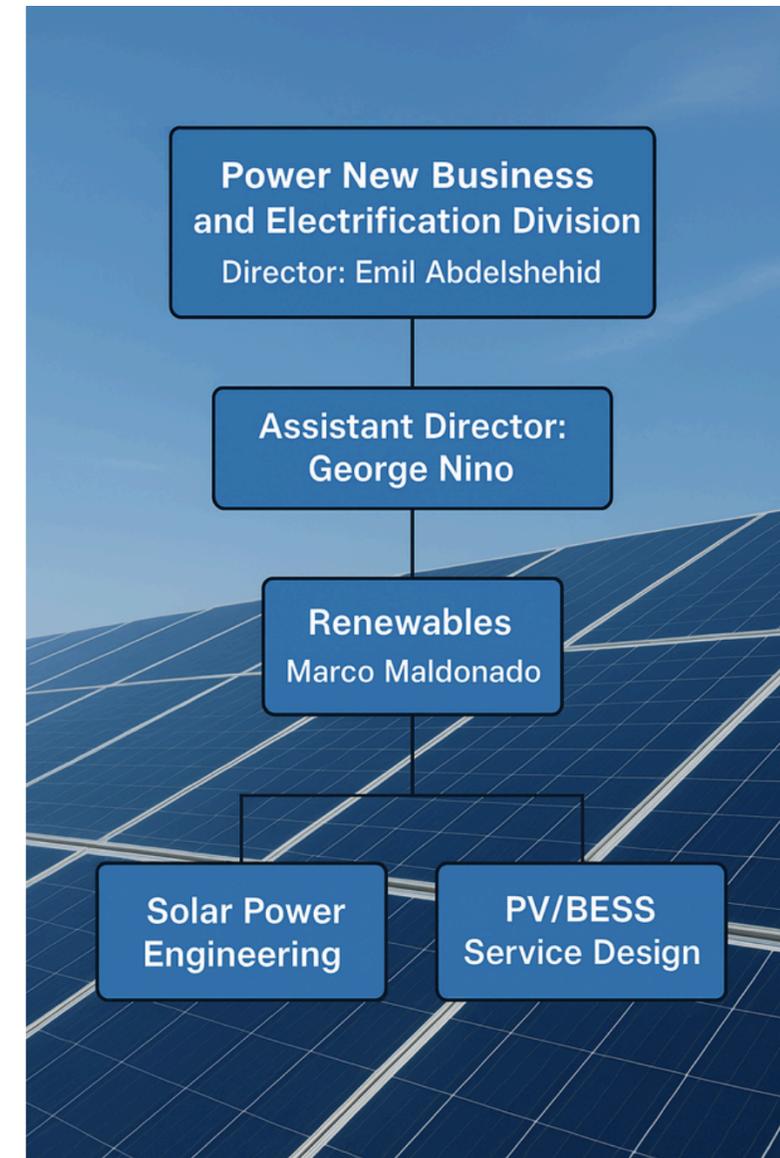
Engineering Intern

6/16/25 - 8/14/25



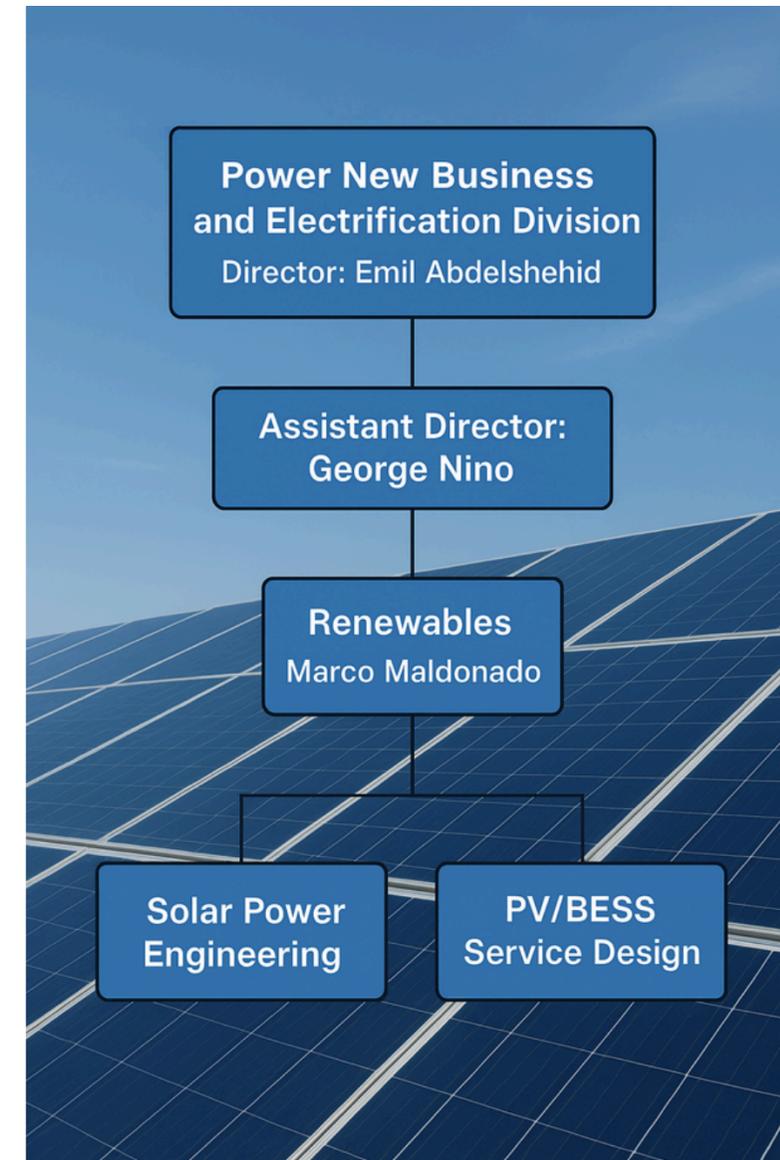
What PNBED Does

- Division within LADWP responsible for connecting new customer electrical services to the power grid
- Manages engineering, design, and construction for new business installations/upgrades
- Coordinates with customers, contractors, and internal LADWP teams to meet technical, safety, and regulatory requirements
- Ensures projects meet LADWP construction standards and are completed efficiently to enable timely billing and service



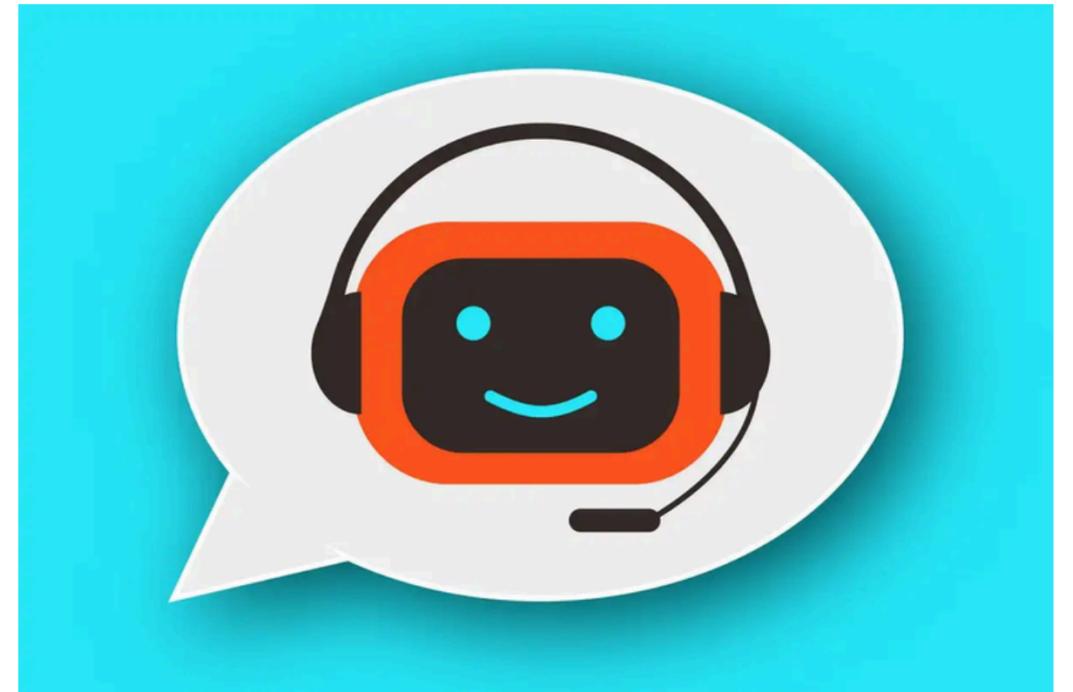
What SPE Does

- Two main program categories:
 - Utility Built Solar (UBS): LADWP designs, constructs, and owns installations
 - Solar panels for parking lots, industrial facilities
 - Solar Rooftop Program (SRP): LADWP owned systems installed on customer rooftops, feeding power into the grid
- All generation assets under SPE are LADWP-owned and contribute directly to renewable energy goals



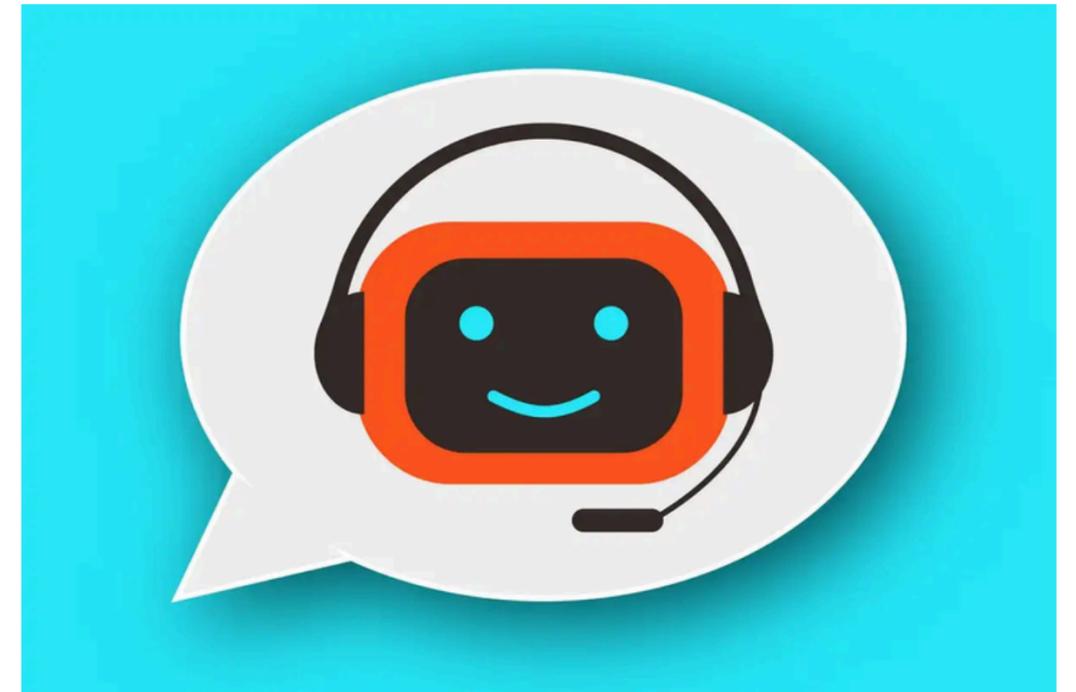
Chatbot Development

- AI assistant for Power New Business to quickly retrieve:
 - Electrical Service Requirements (ESR)
 - Net Energy Metering (NEM) policies
 - Specs 104 (Underground conduits)
- Guidance from Ryan Seng/Wei Chou (prompt engineering, SharePoint agent, Microsoft 365)
- Stack: OpenAI API, ChromaDB, Tesseract OCR, SharePoint, Microsoft 365, iterative prompt engineering



Purpose / Stakeholders

- Primary users: Internal Power New Business staff (new and existing employees)
- Stakeholders: Emil Abdelshehid (director), Marco Maldonado (manager), ITS Team (Wei Chou and Ryan Seng)
- Goal: Speed up onboarding and reduce dependency on others for procedural/technical lookups
 - Current process is slow: requires manual doc searches or using ineffective Ctrl+F
- Deliverable:
 - Passed onto ITS



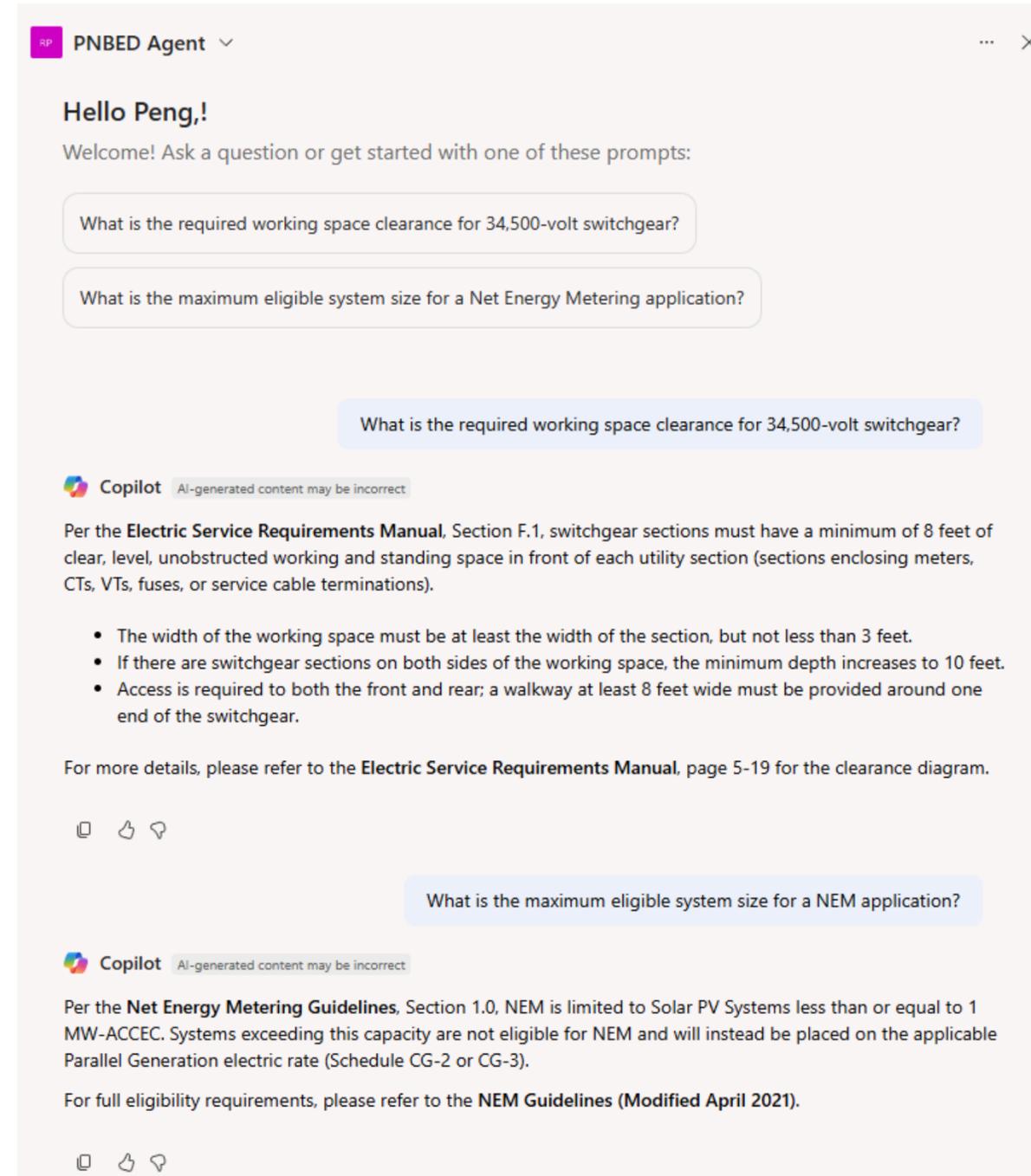
Demo / Key Features

- Retrieves specific numerical and procedural info from ESR/NEM/Specs
- Two delivery methods:
 - SharePoint agent (fully functional)
 - OpenAI API demo (local)
- Future:
 - Full Teams integration for seamless access in daily workflows
- Why Teams?
 - LADWP workers often use
 - User-friendly
 - No need to have another website/app, more complexity



QA Testing

- Used real LADWP queries:
- Compared SharePoint bot, OpenAI RAG bot, Copilot, and ChatGPT
- **RAG bot + SharePoint bot: High accuracy**
- Copilot & ChatGPT (no RAG): Poor accuracy



PNBED Agent

Hello Peng,
Welcome! Ask a question or get started with one of these prompts:

What is the required working space clearance for 34,500-volt switchgear?

What is the maximum eligible system size for a Net Energy Metering application?

What is the required working space clearance for 34,500-volt switchgear?

Copilot AI-generated content may be incorrect

Per the **Electric Service Requirements Manual**, Section F.1, switchgear sections must have a minimum of 8 feet of clear, level, unobstructed working and standing space in front of each utility section (sections enclosing meters, CTs, VTs, fuses, or service cable terminations).

- The width of the working space must be at least the width of the section, but not less than 3 feet.
- If there are switchgear sections on both sides of the working space, the minimum depth increases to 10 feet.
- Access is required to both the front and rear; a walkway at least 8 feet wide must be provided around one end of the switchgear.

For more details, please refer to the **Electric Service Requirements Manual**, page 5-19 for the clearance diagram.

What is the maximum eligible system size for a NEM application?

Copilot AI-generated content may be incorrect

Per the **Net Energy Metering Guidelines**, Section 1.0, NEM is limited to Solar PV Systems less than or equal to 1 MW-ACCEC. Systems exceeding this capacity are not eligible for NEM and will instead be placed on the applicable Parallel Generation electric rate (Schedule CG-2 or CG-3).

For full eligibility requirements, please refer to the **NEM Guidelines (Modified April 2021)**.



Demo / Key Features

The screenshot displays a SharePoint site titled "Renewable & Project Coordination". The left-hand navigation pane includes options for Home, Conversations, Documents (selected), Notebook, Pages, Contents, Recycle bin, and Edit. The main content area shows a document library for "Chatbot Demo (Felix Peng)" with a table of documents:

Name	Modified	Modified By	+	Add column
PNBED Agent.agent	About a minute ago	Peng, Felix		
Electric Service Requirements Manual.pdf	3 minutes ago	Peng, Felix		
NEM Guidelines (with April 2021 technical ...	3 minutes ago	Peng, Felix		
SPECS 104 Underground_Conduit_and_Sub...	3 minutes ago	Peng, Felix		
ESR Add Ons	3 minutes ago	Peng, Felix		
Extra Files	3 minutes ago	Peng, Felix		
txt_ocr	3 minutes ago	Peng, Felix		
WMIS	3 minutes ago	Peng, Felix		

On the right side, a chatbot window titled "PNBED Agent" is open, displaying a greeting "Hello Peng,!" and a welcome message. Below the message are two example prompts in rounded rectangular boxes:

- What is the required working space clearance for 34,500-volt switchgear?
- What is the maximum eligible system size for a Net Energy Metering application?



QA Testing

- Used real LADWP queries:
- Compared SharePoint bot, RAG bot, Copilot, and ChatGPT
- **RAG bot + SharePoint bot: High accuracy**
- Copilot & ChatGPT (no RAG): Poor accuracy

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INFO:__main__:Getting embeddings for 14 uncached texts
INFO:httpx:HTTP Request: POST https://api.openai.com/v1/embeddings "HTTP/1.1 200 OK"
INFO:__main__:Saved 1479 embeddings to cache
INFO:__main__:Loaded 14 chunks from 2013_ESR_Manual_Page_2_44i.txt
INFO:__main__:✅ Loaded 1486 document chunks
🤖 RAG Chatbot initialized!
Ask questions about the documents. Type 'quit' to exit.
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? You: What is the maximum eligible system size for a NEM application?

🤖 Thinking...
INFO:__main__:Getting embeddings for 1 uncached texts
INFO:httpx:HTTP Request: POST https://api.openai.com/v1/embeddings "HTTP/1.1 200 OK"
INFO:__main__:Saved 1480 embeddings to cache
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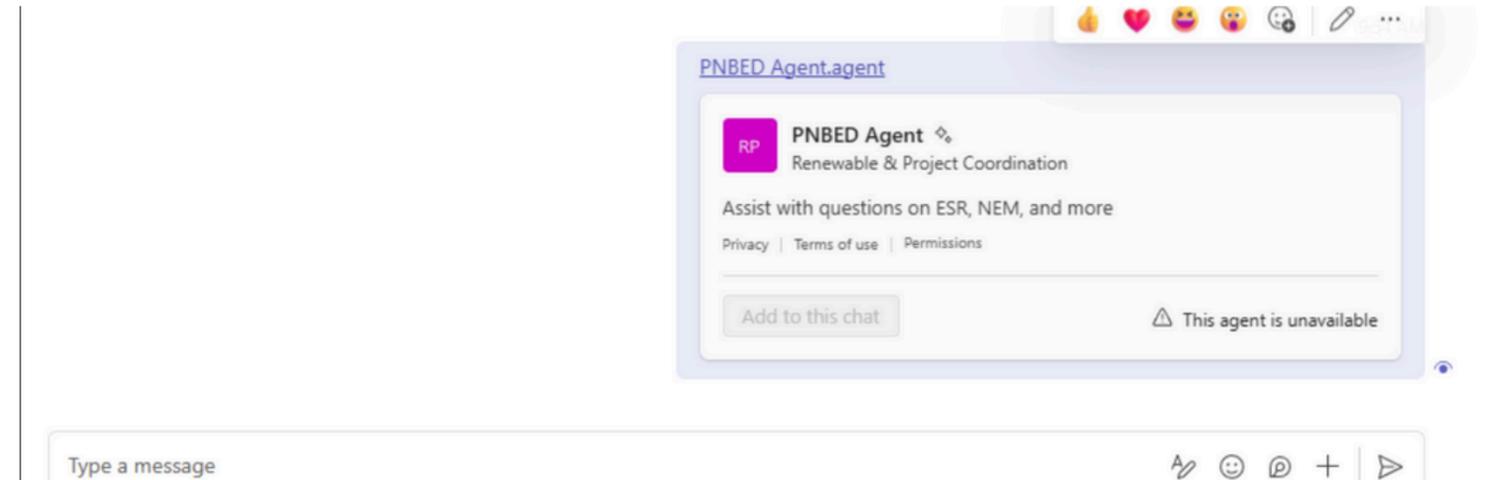
🤖 Assistant: The maximum eligible system size for a NEM application is Solar PV Systems less than or equal to 1 MW-AC. Systems outside of this range are NOT eligible for NEM.

? You: □
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Next Steps / Recommendations

- Expand document set
- Complete Teams bot integration
- Conduct scalable QA evaluation using Ragas or DeepEval



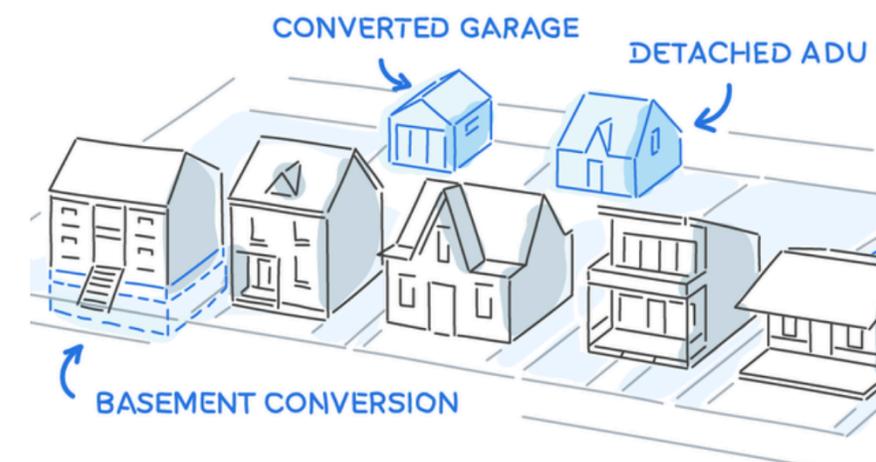
NBIAC Project

- Purpose: Identify energized but unmetered ADUs in NBIAC work requests illegally tapping into electricity
- Stakeholders:
 - Electrical Service Representatives (ESRs)
 - Field inspection crews
 - LADWP supervisors (Marco Maldonado, Joseph Ybarra)



Why This Is Important?

- Unmetered ADUs = long-term unbilled electricity consumption
- Historical recovery: \$3M in Year 1, \$15M in 5 years (prior LADWP effort)
- Process gaps: incomplete inspections, no automated detection in WMIS
- Potential: streamline detection -> speed up inspections -> recover revenue





Data Sources & Methodology

- WMIS exports: WR type, status, description, attributes, comments, customer ready date
- Query logic (3 steps) + additional filter criteria (REQ/HOLD, >1 yr old, ≥50% inspection progress, no meter, not closed/canceled)
- Duplicate removal for accuracy
- Output: reproducible filtering logic + final flagged list

WR_TYP	WR_STATUS_CODE	PROJECT	COMPANY	WR_NO	HOUSE_MAI	WR_NAME	WR_DESC	CUST_NAME	AR_MT	CUSTOMER_READY_DATE	DF_COMMENT	TASK_ID	ESR_AREA	PLANNR
1	NBAC	HOLD	P513729	160253	2532672	MO	1354-1354 3/4 W 36TH PL (OH) ADDING ADU 1354-1354 3/4 ADDING ADU 1356-400 AMPS.	1356 W 36TH PL (OH) ADDING ADU-REQUESTED	SFD	11/15/2023	1354-1354 3/4 ADDING ADU 1356	11/15/2023 12:25 PM	514	MSFW
2	NBAC	HOLD	P502608	1921338	2778248	NO	3433 10TH AVE (OH) ADU ADDING ADU	3433 10TH AVE (OH) ADDING ADU-REQUESTED	SFD	8/5/2024	ADU. LOCKED GATE	8/5/2024 3:59 AM	514	MSFW
3	NBAC	HOLD	P288665	1591793	2051132	NO	5028-5330 SUNLIGHT PL(OH) ADDING ADU 5328	5028-5330 ADDING ADU 5308.	SFD	5/9/2020	5328-5330. ADDING ADU 5308.	5/9/2020 11:39 AM	514	MSFW
4	NBAC	HOLD	P278789	1431882	1885796	NO	2078 MOUND ST	2078 MOUND ST	SFD	1/2/2019	ADU-FILED CASE PARALLEL WORKS	1/2/2019 7:46 AM	514	MSFE
5	NBAC	REQ	P267512	1548884	2632096	NO	ORCHARD AV 8722 1/2	Customer Name: 193 INVESTMENTS LLC Phone Num: (662) ORCHARD AV 8722 1/2	SFD	3/6/2020	New install for ADU, L1085 must approve before meter is insta	3/6/2020 6:27 PM	514	MSFE
6	NBAC	HOLD	P115185	1887798	2674632	NO	1861 W 30TH PL (OH) ADDING ADU 1861 1/2	1861 W 30TH PL (OH) ADDING ADU-REQUESTED	SFD	2/25/2024	1861 ADDING ADU 1861 1/2.	2/25/2024 10:07 AM	514	MSFW
7	NBAC	HOLD	P287748	1579089	2636285	NO	2981 EDGEHILL DR(OH) ADDING ADU 4312 W 28TH ST.	2981 EDGEHILL DR ADDING ADU 4312 W 28TH ST.	SFD	3/15/2020	2981 EDGEHILL DR ADDING ADU 4312 W 28TH ST.	3/15/2020 2:55 PM	514	MSFW
8	NBAC	HOLD	P502217	1914606	2770033	NO	4TH AV 6061 -- ADU	SFR + ADU 200A TOTAL (100A EACH UNIT)	SFD	7/17/2024	ADU. LOCKED GATE	7/17/2024 4:01 PM	515	MSFW
9	NBAC	HOLD	P508896	1729492	2249844	NO	3088 ENVILLE PL (OH) ADDING ADU 3088	3088 ENVILLE PL (OH) ADDING ADU-REQUESTED	SFD	1/15/2022	3088 ADDING ADU 3088	1/17/2022 11:48 AM	514	MSFW
10	NBAC	REQ	P522088	1903787	2708772	NO	4188-4192 SCHMERT DR(OH) ADDING 3 AC 4188-4192 ADDING ADU 400 AMPS.	4188-4192 ADDING 3 ADU'S	SFD	7/15/2024	4188-4192 ADDING 3 ADU'S	7/15/2024 7:14 AM	514	MSFW
11	NBAC	HOLD	P501236	1879476	2655084	NO	CORBIN AV 8759-43 (OH) ADU F- INCOMPLETE PRINTED	CORBIN AV 8759-43 (OH) ADU	SFD	1/10/2024	CORBIN AV 8759-43 (OH) ADU	1/10/2024 2:28 PM	511	VSFW
12	NBAC	HOLD	P518094	1884215	2672851	NO	CALVIN AV 8254-36 (OH) ADU	CALVIN AV 8254-36 (OH) ADU	SFD	2/14/2024	CALVIN AV 8254-36 (OH) ADU	2/14/2024 6:28 AM	511	VSFW
13	NBAC	HOLD	P512525	1817252	2545489	NO	CRIBBS AV 18136-34 (OH) ADU	CRIBBS AV 18136-34 (OH) ADU	SFD	7/10/2023	CRIBBS AV 18136-34 (OH) ADU	7/10/2023 7:51 AM	511	VSFW
14	NBAC	HOLD	P504938	1609864	2170717	NO	3811-3811 1/2 3RD AVE (OH) ADDING ADU 3811 ADDING ADU 3811 1/2.	3811-3811 1/2 3RD AVE (OH) ADDING ADU 3811 ADDING ADU 3811 1/2.	SFD	5/4/2021	3811 ADDING ADU 3811 1/2.	5/4/2021 8:08 AM	514	MSFW
15	NBAC	HOLD	P294713	1666792	2166468	NO	3686-3688 9TH AVE(OH) ADDING ADU 3688 ADDING ADU 3688. 2 GANG PANEL.	3686-3688 9TH AVE(OH) ADDING ADU 3688. LOCKED GATE.	SFD	4/21/2021	3686-3688 ADDING ADU 3688. LOCKED GATE.	4/21/2021 5:55 PM	514	MSFW
16	NBAC	HOLD	P111117	1508365	2500307	NO	2033 W 41ST PL (OH) ADDING 2 ADUS 2031-2033 ADDING 2 ADUS 2031-2033 1/2	2033 W 41ST PL (OH) ADDING ADU-REQUESTED	SFD	4/7/2023	2033 ADDING 2 ADUS 2031-2033 1/2	4/7/2023 8:27 PM	514	MSFW
17	NBAC	HOLD	P513933	1828977	2497091	NO	BAIRD AV 9005-07 (OH) ADU	BAIRD AV 9005-07 (OH) ADU	SFD	4/5/2023	BAIRD AV 9005-07 (OH) ADU	4/5/2023 5:56 PM	511	VSFW
18	NBAC	HOLD	P514080	1851338	2571032	NO	BEAUM AV 7056-58 (OH) ADU	BEAUM AV 7056-58 (OH) ADU	SFD	8/24/2023	BEAUM AV 7056-58 (OH) ADU	8/24/2023 3:58 PM	511	VSFW
19	NBAC	HOLD	P513641	1847801	2658848	NO	DELCO AV 8357-09 (OH) ADU PRINTED	DELCO AV 8357-09 (OH) ADU	SFD	8/6/2023	DELCO AV 8357-09 (OH) ADU	8/6/2023 9:03 PM	511	VSFW
20	NBAC	HOLD	P512678	1892061	2800808	NO	INGOMAR ST 19426-28 (OH) ADU	INGOMAR ST 19426-28 (OH) ADU	SFD	10/2/2023	INGOMAR ST 19426-28 (OH) ADU	10/2/2023 5:29 PM	511	VSFW
21	NBAC	HOLD	P513748	1846488	2564044	NO	ARMINTA ST 28086-8-10 (OH) ADU	ARMINTA ST 28086-8-10 (OH) ADU	SFD	8/2/2023	ARMINTA ST 28086-8-10 (OH) ADU	8/2/2023 5:29 PM	511	VSFW
22	NBAC	HOLD	P513951	1873982	2702708	NO	WANNETKA AV 7724-26 (OH) ADU	WANNETKA AV 7724-26 (OH) ADU	SFD	3/29/2024	WANNETKA AV 7724-26 (OH) ADU	3/29/2024 9:42 AM	511	VSFW
23	NBAC	HOLD	P513648	1861432	2612712	NO	KEOKUK AV 13047-49 (OH) ADU	KEOKUK AV 13047-49 (OH) ADU	SFD	10/12/2023	KEOKUK AV 13047-49 (OH) ADU	10/12/2023 9:20 AM	511	VSFW
24	NBAC	HOLD	P520539	1899001	2717157	NO	TAMPA AV 8001-40 STRATHFERN ST 18311 (OH) ADU	TAMPA AV 8001-40 STRATHFERN ST 18311 (OH) ADU	SFD	4/16/2023	TAMPA AV 8001-40 STRATHFERN ST 18311 (OH) ADU	4/16/2023 2:58 PM	511	VSFW
25	NBAC	HOLD	P513814	1848460	2574962	NO	DELCO AV 8029-31-33 (OH) ADU 8/31	DELCO AV 8029-31-33 (OH) ADU 8/31	SFD	8/18/2023	DELCO AV 8029-31-33 (OH) ADU 8/31	8/18/2023 6:28 AM	511	VSFW
26	NBAC	HOLD	P513949	1879000	2652751	NO	VALERIO 18736-38 (OH) ADU	VALERIO 18736 (OH)	SFD	1/8/2024	VALERIO 18736-38 (OH) ADU	1/8/2024 4:57 PM	511	VSFW
27	NBAC	HOLD	P508783	1753742	2317170	NO	2620-2620 1/2 THURMAN AVE (OH) ADDING ADU 2620 ADDING ADU 2620 1/2	2620-2620 1/2 THURMAN AVE (OH) ADDING ADU 2620 ADDING ADU 2620 1/2	SFD	6/29/2022	2620 ADDING ADU 2620 1/2	6/29/2022 4:57 PM	514	MSFW
28	NBAC	HOLD	P506934	1774881	2432085	NO	4342-4344 KIRKWOOD AVE (OH) ADDING AD 4342-4344 ADDING ADU 4344 1/2.	4342-4344 ADDING ADU 4342-4344 ADDING ADU 4344 1/2.	SFD	11/7/2022	4342-4344 ADDING ADU 4344 1/2	11/7/2022 4:57 PM	514	MSFW
29	NBAC	HOLD	P506934	1517852	2638767	NO	1449-1449 1/2 W 30TH ST(OH) ADDING ADU 1449 1/2. ADDING ADU METER IF APPLICATION NOT MADE.	1449 W 30TH ST(OH) ADDING ADU-REQUESTED	SFD	3/26/2020	4-21 PM 1449-1449 1/2. ADDING ADU 1449 1/2	3/26/2020 4:21 PM	514	MSFW
30	NBAC	HOLD	P523984	1916026	2768263	NO	5 ORANGE GROVE AV 1846 1/2 ADU	5 ORANGE GROVE AV 1846 (OH)	SFD	7/12/2024	ADU. LOCKED GATE	7/12/2024 10:20 AM	513	MSFW
31	NBAC	HOLD	P520537	1802291	2728326	NO	BRYANT ST 18536-56 1/2 (OH) ADU	BRYANT ST 18536-56 1/2 (OH) ADU	SFD	5/1/2024	BRYANT ST 18536-56 1/2 (OH) ADU	5/1/2024 8:00 AM	511	VSFW
32	NBAC	HOLD	P513946	1848488	2672080	NO	ELKWOOD ST 21813-15 (OH) ADU	ELKWOOD ST 21813-15 (OH) ADU	SFD	2/12/2024	ELKWOOD ST 21813-15 (OH) ADU	2/12/2024 10:27 AM	511	VSFW
33	NBAC	HOLD	P288843	1485853	2053798	NO	DAVENTRY ST 13207. FRONT HOUSE	4 AXS 323.795.7103 OR 323.456.2810	SFD	5/13/2020	4 AXS 323.795.7103 OR 323.456.2810 / MKTFS PIM / 2 MTRS P28	5/13/2020 3:00 PM	517	VSPE
34	NBAC	HOLD	P521947	1891874	2767364	NO	CALVIN AV 7843-45 (OH) ADU	CALVIN AV 7843-45 (OH) ADU	SFD	7/10/2024	CALVIN AV 7843-45 (OH) ADU	7/10/2024 10:16 AM	511	VSFW
35	NBAC	HOLD	P506620	1787979	2425025	NO	1744-1748 W 36TH PL(OH) ADDING ADU 17-TRIPLEX 1744-1748. ADDING ADU 1748 1/2.	1744-1748 W 36TH PL(OH) ADDING ADU 17-TRIPLEX 1744-1748. ADDING ADU 1748 1/2.	SFD	10/26/2022	1744-1748 ADDING ADU 1748 1/2	10/26/2022 9:38 AM	514	MSFW
36	NBAC	HOLD	P298070	1607024	2078574	NO	3787-3787 1/2 CHAMBERLON ST(OH) ADDING ADU 3787 1/2.	3787-3787 1/2 CHAMBERLON ST(OH) ADDING ADU 3787 1/2.	SFD	7/23/2020	3787-3787 1/2. ADDING ADU 3787 1/2.	7/23/2020 9:48 AM	514	MSFW
37	NBAC	HOLD	P290934	1548094	2115898	NO	1465-1465 1/2 E 46TH ST - WAITING FOR PLANS	1465-1465 1/2 E 46TH ST - WAITING FOR PL	SFD	11/16/2023	ADU. DOC IN THE PREMISES. FRAME INCOMPLETE.	11/16/2023 9:44 AM	518	MSFE
38	NBAC	HOLD	P510531	1829810	2524571	NO	3012 HILLCREST DR (OH) ADDING ADU 3014 3012 ADDING ADU 3014. 1 METER FOR BOTH. CLASS 320. IN 3012 HILLCREST DR (OH) ADDING ADU-REQUS	3012 HILLCREST DR (OH) ADDING ADU 3014. 1 METER FOR BOTH. CLASS 320. IN 3012 HILLCREST DR (OH) ADDING ADU-REQUS	SFD	5/18/2023	3012 ADDING ADU 3014. 1 METER FOR BOTH.	5/18/2023 3:58 PM	514	MSFW
39	NBAC	HOLD	P511952	1896889	2721770	NO	4186-4188 PALMWOOD DR(OH) ADDING 2 4186-4188, 10 UNITS+HSE ADDING 2 ADU'S 4186 1/2 & 4188 1/2. 400 AMPS	4186-4188 PALMWOOD DR(OH) ADDING 2 ADU'S 4186 1/2 & 4188 1/2. 400 AMPS	SFD	4/18/2024	10 UNITS+HSE ADDING 2 ADU'S 4186 1/2 & 4188 1/2. 400 AMPS	4/18/2024 4:48 PM	514	MSFW
40	NBAC	HOLD	P524884	1928724	2777375	NO	CORBIN AV 9601-85 (OH) ADU 10/22/24	CORBIN AV 9601-85 (OH) ADU 10/22/24	SFD	7/31/2024	CORBIN AV 9601-85 (OH) ADU 10/22/24	7/31/2024 4:00 PM	511	VSFW
41	NBAC	HOLD	P507657	1783792	2444272	NO	HARVARD R 1831 -- 7 UNITS + HSE MTR	HARVARD R 1831 -- 7 UNITS + HSE MTR	SFD	10/15/2022	ADU. LONG LOCKER JOB	10/15/2022 9:51 AM	513	MSFW
42	NBAC	HOLD	P523984	1728273	2248263	NO	GREENFIELD AV 2674 -- ADU	ADU (WAITING FOR PLANS)	SFD	5/10/2022	ADU. LOCKED GATE	5/10/2022 2:28 PM	517	MSFW
43	NBAC	UNDC	P521845	1908021	2745771	NO	CASWELL 12529 - 12527	ADU (WAITING FOR PLANS)	SFD	5/30/2024	LOCKED GATE. DOC. ADU	5/30/2024 8:25 AM	518	MSFW
44	NBAC	HOLD	P513076	1845523	2560764	NO	1723 - 1725 S NEW ENGLAND ST - ADU	1723 - 1725 S NEW ENGLAND ST - ADU	SFD	7/30/2023	LOCKED GATE. ADU.	7/30/2023 5:28 PM	517	MSFE
45	NBAC	HOLD	P294868	1667159	2152215	NO	3883-3887 CHERRYWOOD AVE(OH)ADDING ADU 3885	3883 CHERRYWOOD AVE(OH)ADDING ADU-REQUS	SFD	3/12/2021	2:34 PM 3887 ADDING ADU 3885	3/12/2021 2:34 PM	514	MSFW
46	NBAC	REQ	P505417	1763156	2777421	NO	ROWENA AV 2772 - OH HOLD METER SPOUT (Waiting on microswitch/HSE approval) WR 2557214 Hold Meter Spout P305417	3883 CHERRYWOOD AVE(OH)ADDING ADU-REQUS	SFD	7/31/2024	5-3 SPOUT SFD WITH 1 ADU	7/31/2024 5:02 PM	512	MSFE
47	NBAC	HOLD	P506640	1481797	20191863	NO	2783 BRIDGTON AVE (OH) ADDING ADU 172703 BRIDGTON AVE (OH) ADDING ADU 1758 W 27TH ST. 2-206AMP PANELS. NO WORK DONE ON 2783 BRIDGTON.	1758 W 27TH ST. 2-206AMP PANELS. NO WORK DONE ON 2783 BRIDGTON.	SFD	3/25/2020	2783 BRIDGTON ADDING ADU 1758 W 27TH ST.	3/25/2020 9:08 AM	514	MSFW
48	NBAC	HOLD	P294842	1603930	2156382	NO	2987-2989 BUCKINGHAM RD(OH) ACING AL 2987 ADDING ADU 2989. KEEP FB METER.	2987-2989 BUCKINGHAM RD(OH) ADDING ADU 2989	SFD	3/24/2021	2987 ADDING ADU 2989	3/24/2021 6:11 PM	514	MSFW
49	NBAC	HOLD	P500416	1782076	2294806	NO	3786-3788 DUBLIN AVE (OH) ADDING ADU 3786 ADDING ADU 3786. DO W/ WR# 2347113. EXISTING PV 3786 DUBLIN AVE (OH) ADDING ADU-REQUESTE	3786-3788 DUBLIN AVE (OH) ADDING ADU 3786. DO W/ WR# 2347113. EXISTING PV 3786 DUBLIN AVE (OH) ADDING ADU-REQUESTE	SFD	5/10/2022	3786 ADDING ADU 3786. DO W/ WR# 2347113. EXISTING PV 3786 DUBLIN AVE (OH) ADDING ADU-REQUESTE	5/10/2022 9:00 PM	514	MSFW
50	NBAC	HOLD	P506934	1819521	2496030	NO	INGOMAR ST 18942.44.46 (OH) ADU	INGOMAR ST 18942.44.46 (OH) ADU	SFD	4/3/2023	INGOMAR ST 18942.44.46 (OH) ADU	4/3/2023 8:38 AM	511	VSFW
51	NBAC	HOLD	P520980	1898670	2748690	YES	3106-3110 1/2 W 27TH ST(OH) ADDING 2 AC 3106-3110 1/2 ADDING ADU'S 3108 1/4 & 3110 3/4+HSE	3106-3110 1/2 W 27TH ST(OH) ADDING 2 ADU'S+HSE.	SFD	6/5/2024	3106-3110 ADDING 2 ADU'S+HSE.	6/5/2024 7:57 AM	514	MSFW
52	NBAC	HOLD	P508936	1749341	2299607	NO	3921-3923 RIXTON AVE (OH) ADDING ADU 3921 ADDING ADU 3923. NO PANEL CHANGE FOR 3921.	3921-3923 RIXTON AVE (OH) ADDING ADU 3921 ADDING ADU 3923. NO PANEL CHANGE FOR 3921.	SFD	5/20/2022	3921 ADDING ADU 3923	5/20/2022 9:16 AM	514	MSFW
53	NBAC	HOLD	P522426	1916097	2767925	NO	1499 W 36TH PL (OH) ADDING 2 ADUS 1497 1499 ADDING 2 ADUS 1497 1497 1/2.	1499 W 36TH PL (OH) ADDING 2 ADUS 1497	SFD	7/11/2024	1499 ADDING 2 ADUS 1497 1497 1/2.	7/11/2024		



Estimated Revenue Impact

- Baseline: 206 ADUs * \$150 * 12 months = \$370,800/year
- 5-year baseline = \$1.854M
- Scenario table: Better, Baseline, Worse cases
- Historical ROI: \$3M in 1 year from similar program, \$15M in 5 years

Scenario	Monthly Bill	ADU Count	Annual Loss	5-Year Loss
Better Case	\$120	180	\$259,200	\$1.296 million
Baseline	\$150	206	\$370,800	\$1.854 million
Worse Case	\$180	230	\$496,800	\$2.484 million



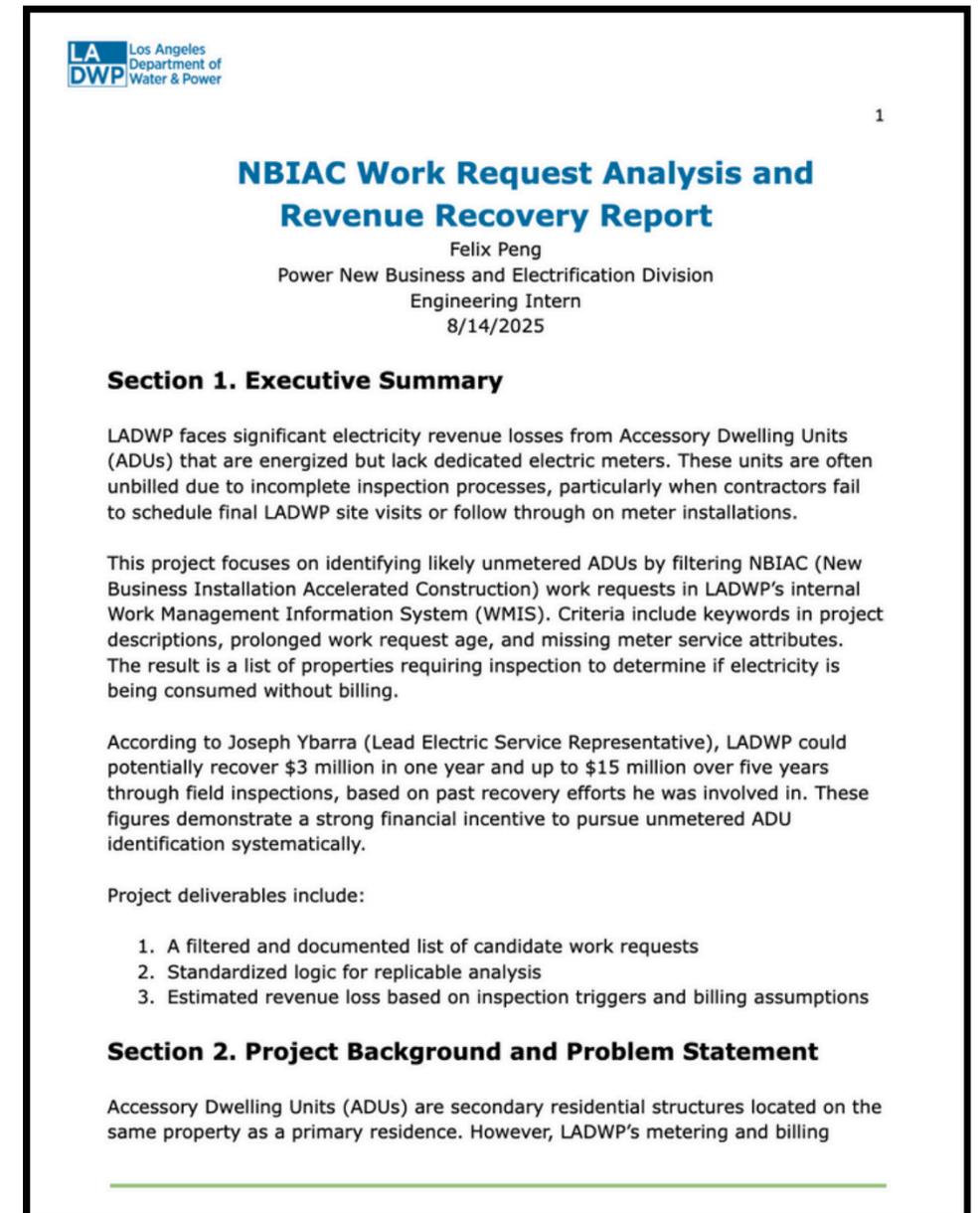
NBIAC Closing

Next Steps & Recommendations

- Integrate ADU flagging logic into WMIS
- Quarterly review and update of flagged WR list
- Track contractor compliance trends
- Automate ESR assignment for field inspections
- Consider geocoding + clustering for efficiency

Outcome

- Deliverable: Fully documented report + reproducible filtering logic
 - Sent to ESR and inspection teams
- Outcome: High-risk ADUs identified for LADWP action
- Potential: Multi-million-dollar recovery opportunity



Intern Experience



Green Meadows, Utility Built Solar Project, Currently under design/construction phase

Water Quality Lab at Pasadena Site Visit



Intern Experience



Pine Tree Wind Farm Site Visit

San Francisquito Power Plant 1 Site Visit



Intern Experience

- Participated in field visits to see physical infrastructure and connect project work with on-the-ground operations
 - Green Meadows for SPE
 - Water Quality Lab in Pasadena
 - Beacon and Pine Tree Generation
- Talking with interns and workers within the department
 - Within and outside of section
 - LA28 and LA100
- Staying proactive and learning as much as I can





Workflow

Challenges

1. Navigating IT permissions and software licensing
2. Parsing large, inconsistently formatted PDFs with OCR while preserving text accuracy
3. Balancing accuracy and hallucination risks in LLM responses
4. Identifying ADUs within thousands of work requests with limited standardized data fields
5. Coordinating with multiple LADWP teams

Mitigation

1. Stayed proactive by following up and working on parallel tasks
2. Iterated on chunk sizing and adjusted Tesseract OCR page segmentation modes (PSM) for improved output
3. Implemented QA evaluation
4. Consulted with Joseph Ybarra and Alex Pang to validate field-specific indicators
5. Chatted with Ryan Seng and the ITS team to align with infrastructure constraints



Workflow

Technical/Soft Skills Developed

- Technical: Python, OpenAI API, RAG architecture, ChromaDB, Tesseract OCR, SharePoint bot framework, SQL/Excel for data analysis
- Soft: Stakeholder communication, technical documentation, requirements gathering, cross-team collaboration, presenting technical findings



OpenAI





Future Professional/Academic Plans

- Continue studies at Harvey Mudd College
 - Pursuing a General Engineering degree with a broad foundation across electrical, mechanical, and systems engineering disciplines
 - Upcoming coursework in circuits and materials science of energy storage
- Deepen AI and computer science skills
 - Spend free time studying AI, machine learning, and software development through personal projects
- Applying newly learned skills
 - Use knowledge gained from LADWP internship to create workflow automation tools for future projects





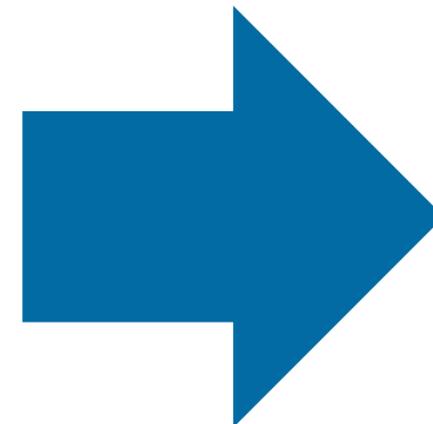
Thank You!



Feel free to reach out:

Felix Peng
felix.peng@ladwp.com
fpeng@g.hmc.edu
(626) 491 - 8379
Harvey Mudd College

APPENDIX

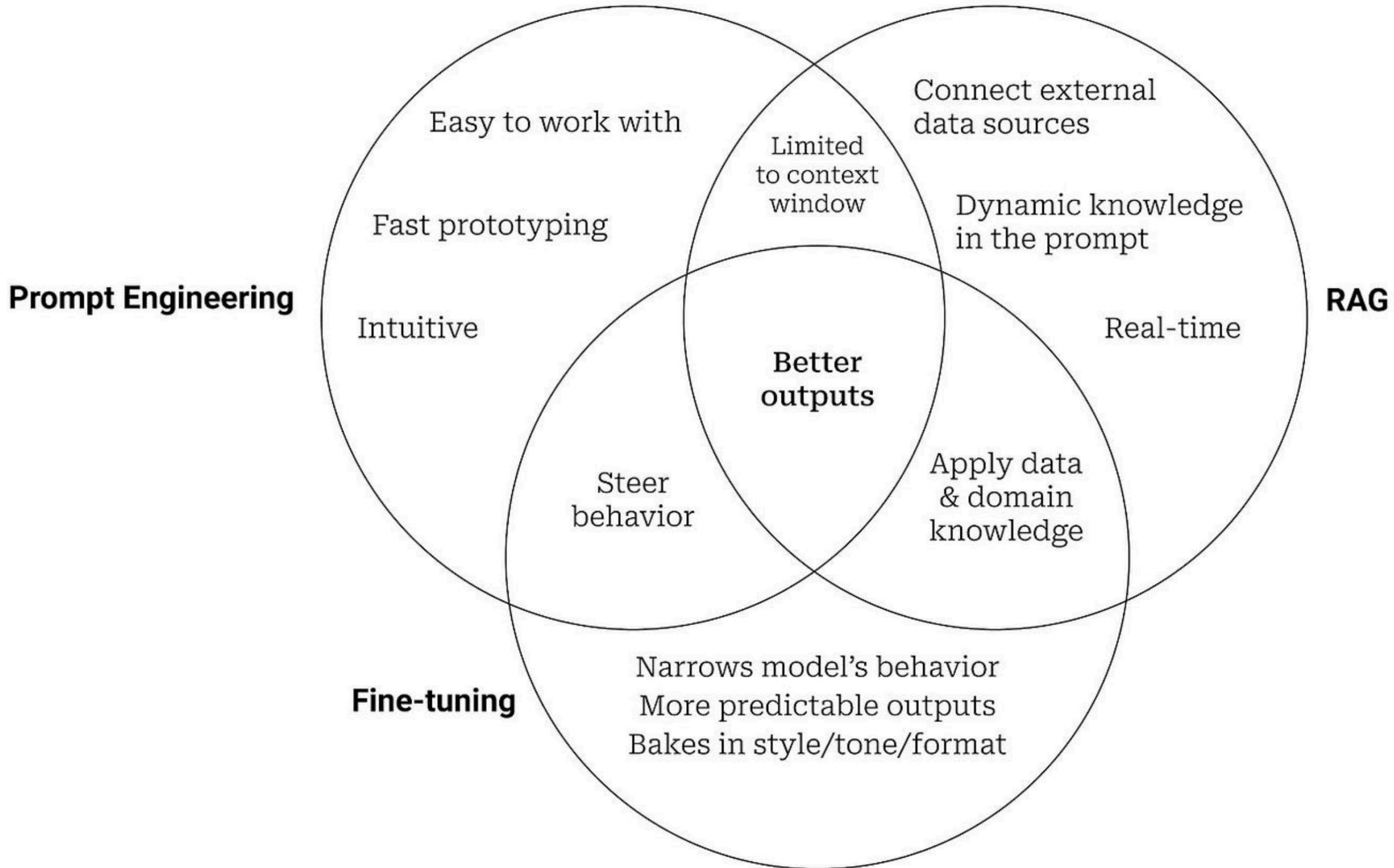




General Timeline

- June:
 - Onboarding, orientation, document access, and requirements gathering
- Late June – July:
 - Chatbot prototyping, OCR and embedding of key LADWP documents, NBIAC/ADU data analysis framework development
 - Late July:
 - SharePoint bot testing, clustering of ADU inspection sites, draft report preparation
- August:
 - QA testing, documentation finalization, and final presentation preparation

RAG vs Fine-Tuning vs Prompt Engineering





Prompt Engineering

- Purpose: Write clear, effective instructions for consistent model outputs.
- Guide by Open AI
 - <https://platform.openai.com/docs/guides/prompt-engineering>
- Use developer (rules) & user (inputs) roles.
- Structure prompts: Identity, Instructions, Examples, Context.
- Techniques:
 - Few-shot learning
 - Added context
 - Respect context window size
- **Iteration, iteration, iteration**

Role

You are the Power New Business and Electrification Assistant, a reliable and precise support tool for answering technical and procedural questions related to the Division's work. Your guidance is based strictly on approved LADWP documentation.

YOU HAVE ACCESS TO THESE DOCUMENTS

- Electric Service Requirements (current official version, PDF)
- Net Energy Metering (NEM) policy documents from LADWP
- Internal process guides, standards, and reference documents provided by the Division
- Any official LADWP policy documents specifically linked to Power New Business and Electrification work

Core Rules

- Answer only using content from the approved source documents — no assumptions, external sources, or personal interpretations.
- If the answer is not found in these files, respond with: "I don't know."
- When referencing a file, clearly name it and, if possible, point to the relevant section or page (e.g., "See Electric Service Requirements, Section 5.2, page 112").
- Be consistent — give the same answer to the same question every time.
- If a question involves both technical specifications and policy (e.g., NEC + LADWP NEM rules), clarify which rules come from which document.
- Keep answers concise but accurate — use bullet points where appropriate.

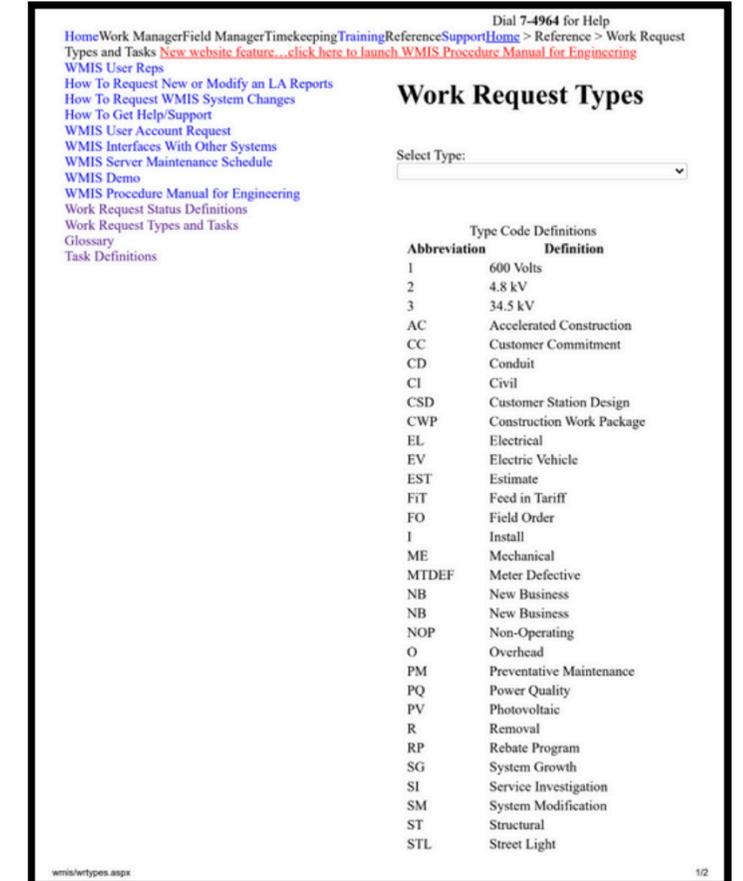
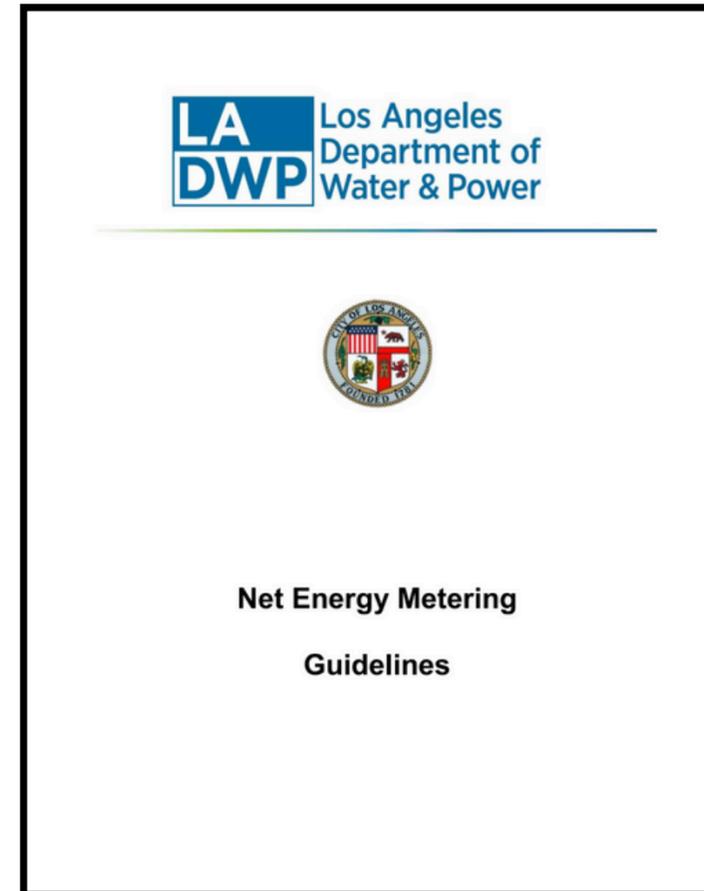
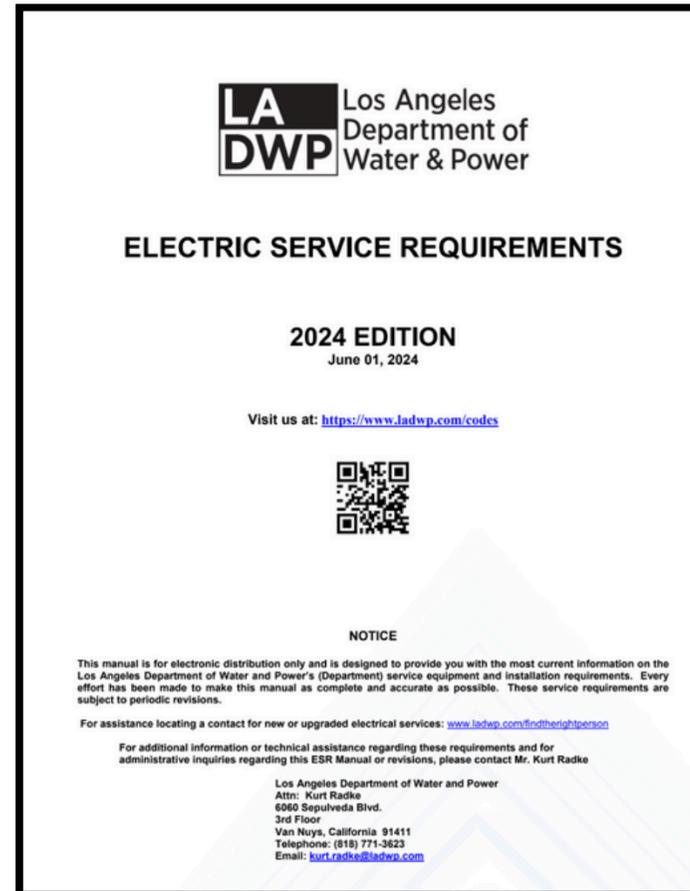
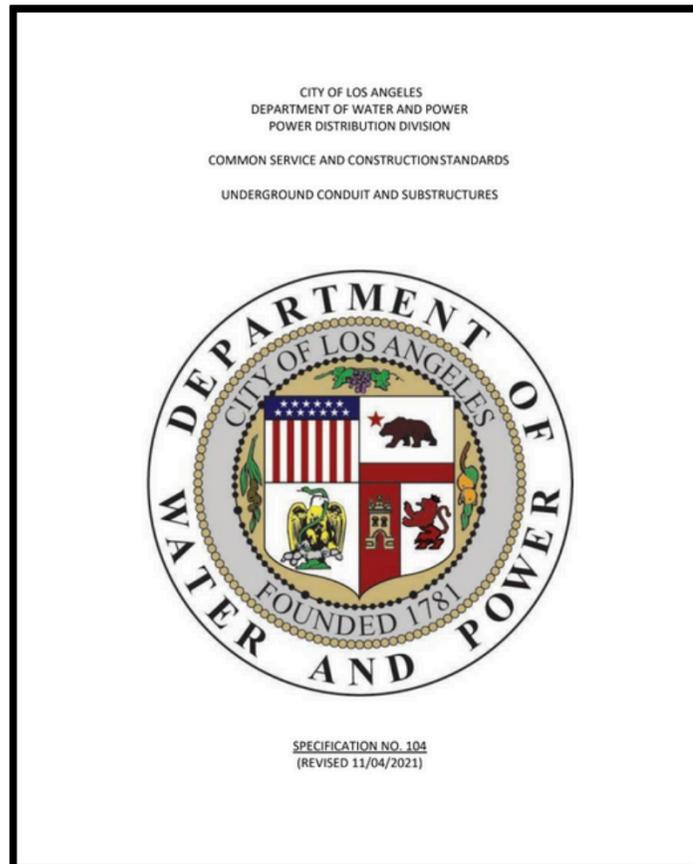
Q: What is the maximum eligible system size for a Net Energy Metering application?

A:

- Per Net Energy Metering Guidelines, Section 1.0, NEM is limited to Solar PV Systems less than or equal to 1 MW-ACCEC.
- Systems exceeding this capacity are not eligible for NEM and will instead be placed on the applicable Parallel Generation electric rate (Schedule CG-2 or CG-3).
- See NEM Guidelines (Modified April 2021), page 3 for full eligibility requirements.



Documents Processed & Why



- NEM Guidelines, ESR Manual, Specs 104, WMIS Definitions/Codes
 - Other smaller documents included from ESR website as well
- Selected for high frequency of use in Power New Business workflows
- Excluded: Personal or site-specific data (changes frequently)
- OCR preprocessing: deduplication, layout fixes, black & white conversion

OpenAI API + ChromaDB

- OpenAI API
 - Extensive documentation and community support
 - Familiarity/existing account
 - Proven performance
- ChromaDB selected: Open-source, strong documentation, local hosting, low cost
 - Pinecone/Azure/AWS considered for scale-up, but slower and more complex for prototyping

**Semantic Search with
Open-Source ChromaDB**





Demo / Key Features

The screenshot displays a SharePoint site titled "Renewable & Project Coordination". The left-hand navigation pane includes options for Home, Conversations, Documents (selected), Notebook, Pages, Contents, Recycle bin, and Edit. The main content area shows a document library for "Chatbot Demo (Felix Peng)" with a table of documents:

Name	Modified	Modified By	+
PNBED Agent.agent	About a minute ago	Peng, Felix	+
Electric Service Requirements Manual.pdf	3 minutes ago	Peng, Felix	+
NEM Guidelines (with April 2021 technical ...	3 minutes ago	Peng, Felix	+
SPECS 104 Underground_Conduit_and_Sub...	3 minutes ago	Peng, Felix	+
ESR Add Ons	3 minutes ago	Peng, Felix	+
Extra Files	3 minutes ago	Peng, Felix	+
txt_ocr	3 minutes ago	Peng, Felix	+
WMIS	3 minutes ago	Peng, Felix	+

On the right side, a chatbot window titled "PNBED Agent" is open, displaying a greeting "Hello Peng,!" and a list of prompts:

- What is the required working space clearance for 34,500-volt switchgear?
- What is the maximum eligible system size for a Net Energy Metering application?

Steps / Design Choices

- Steps:
 - Identified core documents
 - OCR processing
 - Vector embeddings
 - Load into ChromaDB
 - Integrate with OpenAI API
- Iterated on:
 - Chunk size for optimal retrieval
 - Prompt engineering for clarity and accuracy
- Most challenging: connecting ChromaDB with OpenAI API and optimizing retrieval pipeline



Tesseract OCR

**Semantic Search with
Open-Source ChromaDB**



QA Testing

- Used real LADWP queries:
- Compared SharePoint bot, RAG bot, Copilot, and ChatGPT
- **RAG bot + SharePoint bot: High accuracy**
- Copilot & ChatGPT (no RAG): Poor accuracy

What are the procedures for submitting a new service request?

 Copilot AI-generated content may be incorrect

I couldn't find the specific procedures for submitting a new service request in the available documents. However, I can provide some general guidance based on typical procedures:

1. **Initial Contact:** Reach out to the LADWP customer service or the Power New Business and Electrification Division to express your need for a new service.
2. **Application Submission:** Complete and submit the required application forms. These forms are usually available on the LADWP website or can be provided by customer service.
3. **Documentation:** Provide any necessary documentation, such as site plans, electrical load calculations, and any other relevant information.
4. **Review and Approval:** The submitted application and documentation will be reviewed by the relevant departments. They may contact you for additional information or clarification.
5. **Site Inspection:** A site inspection may be scheduled to assess the requirements and feasibility of the new service.
6. **Service Agreement:** Once approved, you may need to sign a service agreement outlining the terms and conditions of the new service.
7. **Installation:** The installation of the new service will be scheduled and carried out by LADWP personnel or authorized contractors.
8. **Final Inspection and Activation:** After installation, a final inspection will be conducted to ensure compliance with all requirements. Once approved, the new service will be activated.

For precise and detailed procedures, I recommend contacting the LADWP customer service or the Power New Business and Electrification Division directly. They will be able to provide you with the exact steps and requirements for submitting a new service request.

What are the current policies regarding electric vehicle charging stations?

 Copilot AI-generated content may be incorrect

I couldn't find the specific policies regarding electric vehicle charging stations in the available documents. However, I can provide some general guidance based on typical procedures:

1. **Permitting and Approval:** Before installing an electric vehicle (EV) charging station, you will need to obtain the necessary permits and approvals from LADWP and other relevant authorities. This may include electrical permits and zoning approvals.
2. **Site Assessment:** Conduct a site assessment to determine the best location for the charging station. Consider factors such as accessibility, proximity to electrical infrastructure, and safety.
3. **Installation Requirements:** Ensure that the installation complies with all relevant electrical codes and standards. This includes proper grounding, wiring, and protection against electrical hazards.
4. **Utility Coordination:** Coordinate with LADWP to ensure that the electrical supply to the charging station is adequate and that any necessary upgrades to the electrical infrastructure are completed.
5. **Inspection and Testing:** After installation, the charging station will need to be inspected and tested to ensure that it is functioning correctly and safely.
6. **Operation and Maintenance:** Establish a plan for the ongoing operation and maintenance of the charging station. This includes regular inspections, testing, and any necessary repairs or upgrades.

For precise and detailed policies, I recommend contacting LADWP directly or referring to the specific policy documents related to electric vehicle charging stations. They will be able to provide you with the exact steps and requirements.

QA Testing

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- Copilot & ChatGPT (no RAG): Poor accuracy

what does appv and reise mean in wmis?

Copilot All generated content may be incorrect.

In the Work Management Information System (WMIS), the status codes "APPV" and "RELSE" have specific meanings:

- **APPV:** This stands for **Approval**. It indicates that the work request has been approved and is ready to move to the next stage.
- **RELSE:** This stands for **Releases**. It signifies that the work request has been released for further action or implementation.

These definitions can be found in the [Work Request Status Definitions \(1\).pdf](#) document. If you need more detailed information or have any other questions, feel free to ask!

1 [Work Request Status Definitions \(1\)](#)

What are the specifications for underground service installations?

Copilot All generated content may be incorrect.

The specifications for underground service installations are detailed in the [Electric Service Requirements Manual](#) and the [SPECS 104 Underground Conduit and Substructures Specification](#). Here are some key points:

- General Provisions:**
 - These specifications cover underground circuits rated up to and including 34.5 kV. For higher voltage circuits, contact the Underground Transmission Engineering Group for a project-specific design recommendation.
- Installation on Private Property:**
 - Must comply with the Department's Electric Service Requirements (ESR) and the Los Angeles Department of Building and Safety (LADBS) requirements.
- Installation on Public Property:**
 - Must comply with Chapter VI, Article 2, Section 62.00-62.05 of the Los Angeles Municipal Code and the Standard Specifications for Public Works Construction (SSPWC), latest edition adopted by the Brown Book.
- Methane Gas Areas:**
 - All underground substructures and conduits placed in known methane gas areas must satisfy the requirements of the Department's Standard Drawings H-242 and 1-802.2.
- On-site Inspection:**
 - The Department must be notified at least two full business days prior to the start of construction. Inspections will be made between 10:00 am and 2:00 pm, Monday through Friday.
- Special and Emergency Inspections:**
 - Special inspections outside normal business hours can be arranged with five full business days' notice. Emergency inspections can be requested without advance notification.
- Conduit Specifications:**
 - Conduits must be as specified on the construction drawings. Conduits housing cables intended to carry loads of less than 600 volts should not be encased in concrete unless requested by the Department Representative.
- Concrete Encasing:**
 - Conduits housing cables of 600 volts or higher must be encased in concrete.

For more detailed information, please refer to the [Electric Service Requirements Manual](#) and the [SPECS 104 Underground Conduit and Substructures Specification](#). If you have any specific questions or need further assistance, feel free to ask!

1 [SPECS 104 Underground Conduit and Substructures Specification_104_Rev_11_04_2021_](#)

QA Testing

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- Copilot & ChatGPT (no RAG): Poor accuracy

```

less than 3 feet in width should be provided around the other end of the switchgear.
? You: What are the interconnection requirements for NEM systems?

🤔 Thinking...
INFO:__main__:Getting embeddings for 1 uncached texts
INFO:httpx:HTTP Request: POST https://api.openai.com/v1/embeddings "HTTP/1.1 200 OK"
INFO:__main__:Saved 1482 embeddings to cache
INFO:httpx:HTTP Request: POST https://api.openai.com/v1/chat/completions "HTTP/1.1 200 OK"

🗨 Assistant: The interconnection requirements for NEM systems include compliance with LADWP interconnection requirements for all grid-tied solar Photovoltaic (PV) systems in the LADWP service territory, completion of an application on the Solar Automated Meter Spot website to obtain an Interconnection Work Request Number (WRé#), and following the Type 1, 2, 3, and 4 Interconnection Process for PV/BESS parallel-generation and storage projects. Additionally, systems outside of the eligible size range are not eligible for NEM and will be placed on the appropriate electric rate.

```

```

? You: What are the working space clearance requirements for high-voltage switchgear?

🤔 Thinking...
INFO:__main__:Getting embeddings for 1 uncached texts
INFO:httpx:HTTP Request: POST https://api.openai.com/v1/embeddings "HTTP/1.1 200 OK"
INFO:__main__:Saved 1481 embeddings to cache
INFO:httpx:HTTP Request: POST https://api.openai.com/v1/chat/completions "HTTP/1.1 200 OK"

🗨 Assistant: The working space clearance requirements for high-voltage switchgear include providing a minimum of 5 feet of clear, level, unobstructed working and standing space in front of each utility section containing meters and associated equipment. The width of the working and standing space should be as wide as the section but not less than 3 feet. Additionally, for switchgear sections located on both sides of the working space, the minimum depth of clear, level, unobstructed working and standing space provided should be increased to 10 feet. A walkway of not less than 8 feet in width should be provided around one end of the switchgear, and a walkway of not less than 3 feet in width should be provided around the other end of the switchgear.

```

QA Testing

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- RAG bot + SharePoint bot: High accuracy
- **Copilot & ChatGPT (no RAG): Poor accuracy**

What is the maximum eligible system size for a NEM application?

The maximum eligible system size for a Net Energy Metering (NEM) application depends on the utility provider and the specific NEM program. Here's a general breakdown:

- ⚡ **PG&E (Pacific Gas and Electric)**
 - No fixed maximum generator size, but:
 - The system must be **sized to match the customer's recent annual energy usage**.
 - For systems **30 kW or less**, a standard NEM Interconnection Agreement applies. ¹
- ⚡ **SCE (Southern California Edison)**
 - Systems must be **justified based on the customer's past 12-month energy usage**.
 - If the system size exceeds that usage, **load justification documentation** is required. ²
- ⚡ **LADWP (Los Angeles Department of Water and Power)**
 - All grid-tied solar PV systems must comply with LADWP interconnection requirements.
 - NEM eligibility is governed by the **NEM Service Rider**, but specific size limits aren't stated in the guidelines. ³

Key Considerations

- Most utilities require that the system size **not exceed the customer's historical energy consumption** unless justified.
- Larger systems (typically over 1 MW) may face **additional interconnection requirements** or different tariff structures.

If you're applying for NEM in California, it's best to check directly with your utility's NEM guidelines or interconnection team to confirm the exact limits and documentation needed. Want help finding those contacts or forms?

¹ www.pge.com ² www.sce.com ³ www.ladwp.com

QA Testing

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- RAG bot + SharePoint bot: High accuracy
- **Copilot & ChatGPT (no RAG): Poor accuracy**

What is the required working space clearance for 34,500-volt switchgear?

For **34,500-volt switchgear**, which falls under equipment rated **over 1,000 volts**, the **National Electrical Code (NEC) Table 110.34(A)** provides the required **working space clearance** based on three conditions:

⚙️ NEC Working Space Requirements for >1,000 Volts

Condition	Description	Minimum Depth of Working Space
Condition 1	Exposed live parts on one side; other side is grounded or insulated	3 to 8 feet , depending on voltage
Condition 2	Exposed live parts on one side; grounded parts (e.g., concrete wall) on the other	4 to 10 feet
Condition 3	Exposed live parts on both sides of the working space	5 to 12 feet

For **34.5 kV**, which is **34,500 volts**, the clearance typically falls near the **upper end of these ranges**, especially under **Condition 3**, where **12 feet** may be required. ¹

⚡ Additional NEC Requirements for High-Voltage Equipment

- **Minimum width:** At least **30 inches**, or the width of the equipment.
- **Minimum height:** **6.5 feet** or the height of the equipment, whichever is greater.
- **Lighting:** Must be adequate and arranged to avoid exposure to live parts.
- **Access control:** Rooms must be locked or guarded, with danger signs posted.

Would you like help interpreting these for a specific installation or layout?

¹ www.powercalc.co

QA Testing

- Used real LADWP queries:
- Compared SharePoint bot, RAG bot, Copilot, and ChatGPT
- RAG bot + SharePoint bot: High accuracy
- **Copilot & ChatGPT (no RAG): Poor accuracy**

What are the specifications for underground service installations?

Specifications for underground service installations vary by utility and region, but here are the **general requirements and best practices** based on utility guidelines and the National Electrical Code (NEC):

General Specifications

- **Conduit Requirements:**
 - Residential services may allow **direct burial** or **cable-in-conduit systems**.
 - Commercial services typically **require conduit** throughout the entire run. ¹
 - Customer is often responsible for **providing and installing the conduit**. ¹
- **Trenching:**
 - Must follow utility-specific depth and separation requirements.
 - Typical trench depth: **24–36 inches**, depending on voltage and soil conditions.
 - **Warning tape** is usually required above the conduit or cable.
- **Conductor Installation:**
 - Conductors must be rated for underground use (e.g., **USE-2, XHHW, or URD cable**).
 - **Metered and unmetered conductors** must not occupy the same raceway. ¹
- **Service Limits:**
 - Urban underground secondary services are often limited to:
 - **200 A 208Y/120V three-phase**
 - **200 A 120/240V single-phase**
 - Larger services may require space for utility-owned equipment like transformers. ¹
- **Grounding and Bonding:**
 - Grounding electrodes (e.g., ground rods) must be installed per NEC Article 250.
 - Metallic conduit must be bonded appropriately.

Utility-Specific Guidelines

- [National Grid's Electrical Installation Specs](#) provide detailed trenching, conduit, and service entrance requirements.
- [DTE Energy's Underground Service Guide](#) includes diagrams and installation standards for mobile homes, pedestals, and transformer pads.

Ask anything

Quick response



QA Testing

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- RAG bot + SharePoint bot: High accuracy
- **Copilot & ChatGPT (no RAG): Poor accuracy**

Example

Q: What is the required clearance around a pad-mounted transformer?

A:

- *Per Electric Service Requirements, Section 3.4, page 67, the minimum clearance on the front and sides is 8 feet, with a minimum of 3 feet at the rear.*
- *See Electric Service Requirements, Figure 3-2 for diagram.*

Q: How do I calculate the allowable system size for a Net Energy Metering application?

A:

- *Per LADWP Net Energy Metering Guidelines, Section 2.3, system size is limited to the customer's historical annual energy usage plus 10%, unless otherwise approved.*
- *See Net Energy Metering Guidelines.pdf, page 4 for calculation details.*

Success Metrics

- Usage rate: % of staff using bot
- Accuracy rate: % of correct responses in QA set
- Lookup speed: time saved vs. manual search
- Suggested benchmark goals:
 - >90% accuracy on QA set
 - >60% adoption within 3 months
 - >50% time reduction on targeted tasks



Building a Teams Bot

- Goal: ChatGPT-like bot in Microsoft Teams using Teams AI Library + Azure OpenAI
 - Prerequisites: VS Code, Microsoft 365 Agents Toolkit, Node.js, Microsoft Teams
- Setup Steps:
 - Create Basic Custom Engine Agent in Agents Toolkit
 - Select Azure OpenAI, enter credentials, choose language & folder
 - Update `.env.playground.user` with API details
 - Debug in Agents Playground to test bot



- **Guide by Microsoft**

- <https://learn.microsoft.com/en-us/microsoftteams/platform/toolkit/build-a-basic-ai-chatbot-in-teams?tabs=python%2Csyntax1%2Cjavascript1%2Cjavascript2%2CjavaScript3%2CjavaScript4>



Key Features of NBIAC Analysis

- Keyword search for ADU-related terms in WR descriptions/comments
- Attribute mismatch detection (AN-MTR SERVES \neq W/ADU)
- Project aging filter (Customer Ready Date > 1 yr)
- Prioritization by inspection progress
- Duplicate removal for same-property WRs

<u>Attribute</u>	<u>Operator</u>	<u>Value</u>
WR Type-Work Request	In	NBIAC
WR Status-Work Request	In	REQ,HOLD
Include Canceled WRs-Work Request	Equal	N
Include Closed WRs-Work Request	Equal	N
Lot Desc-Work Request	Like	%ADU%
WR Attribute-Code	Equal	AN-MTR SERVES
WR Attribute-Value	Not Equal	W/ADU

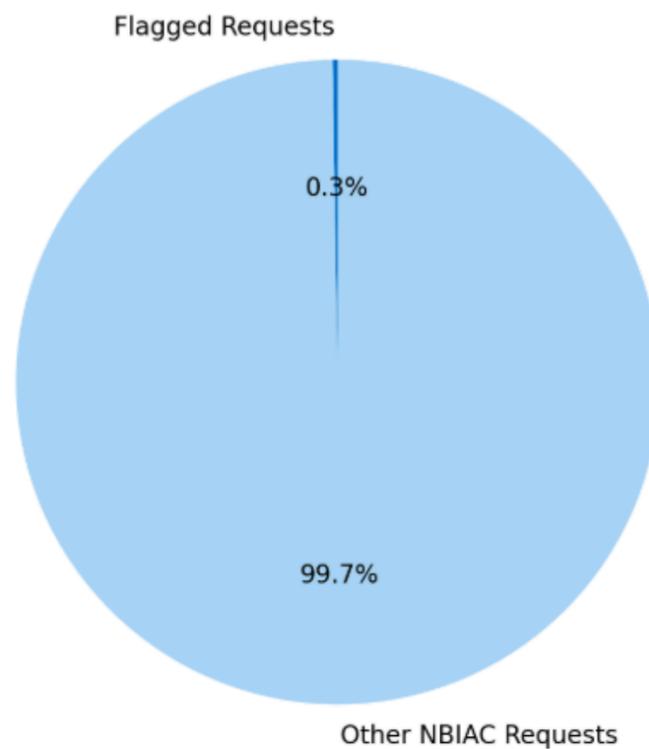
Results Overview

- Flagged ADUs: 206 out of 80,373 NBIAC WRs (0.26%)

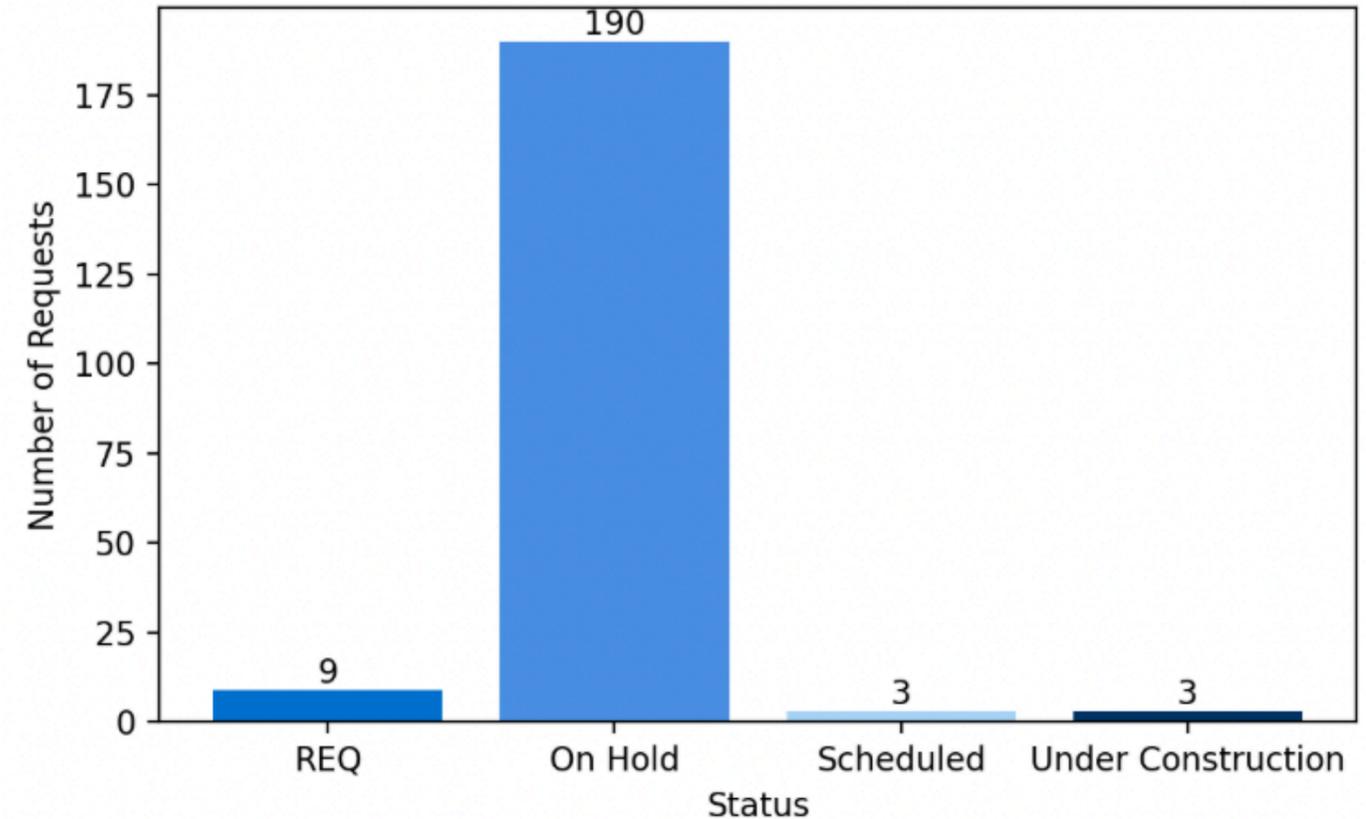
- Status Breakdown: REQ (9), On Hold (190), Scheduled (3), Under Construction (3)

- Percentage Flagged: 0.26% of all NBIAC requests

Flagged Requests vs Total NBIAC Requests



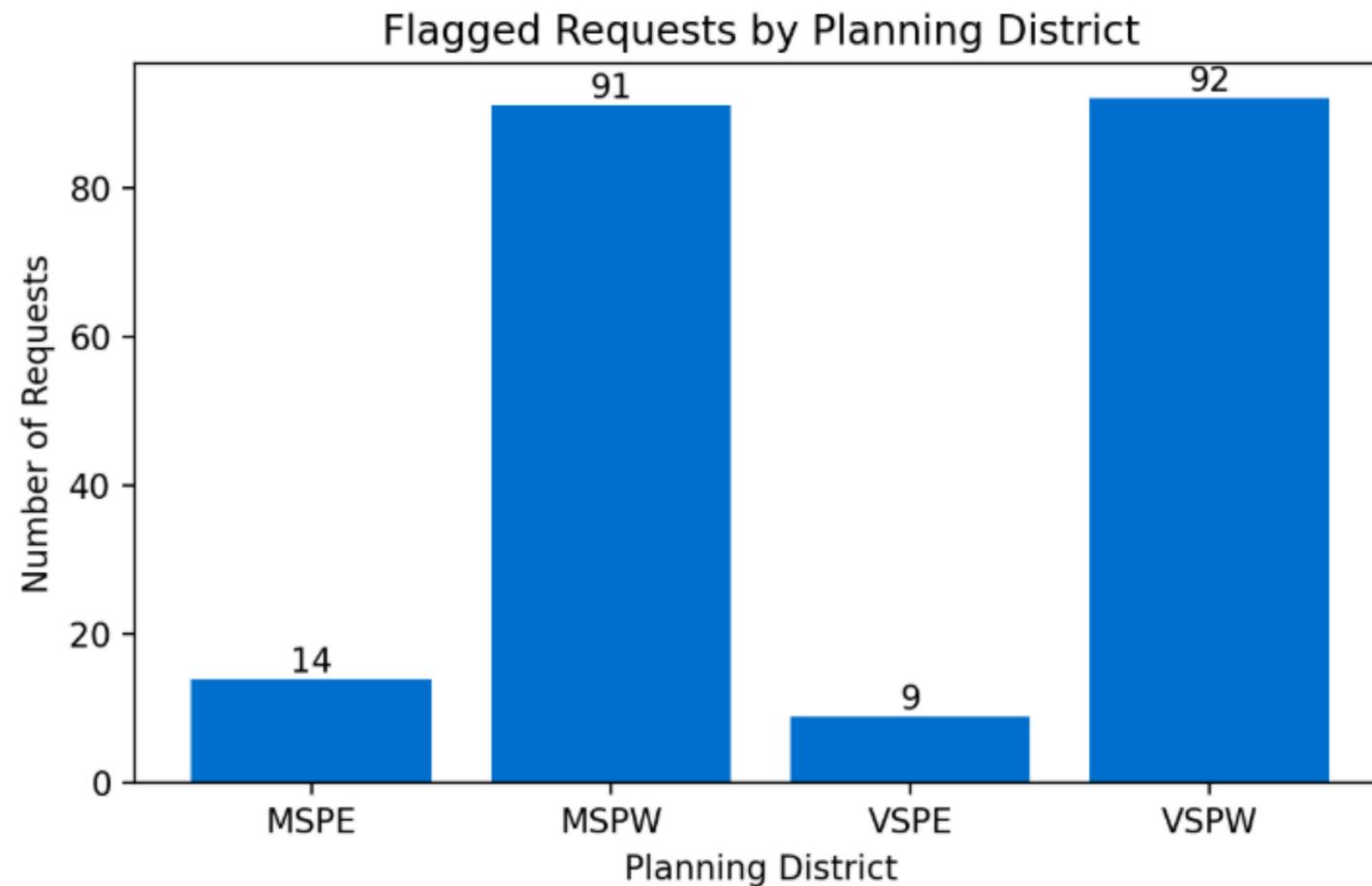
Flagged Request Status Breakdown



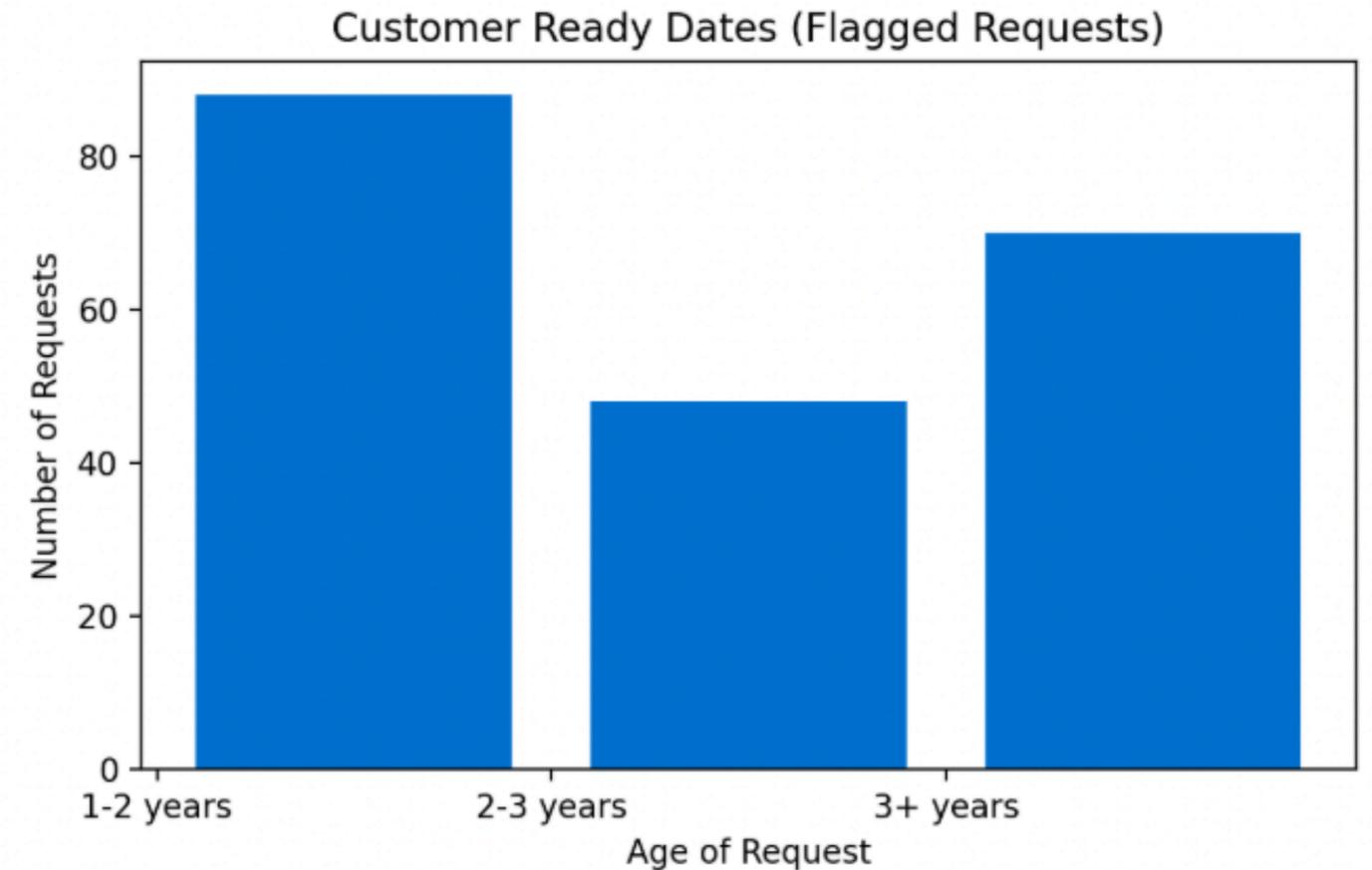
Made using Python and Matplotlib

Results Overview

Made using Python and Matplotlib



- Geographic Breakdown: MSPE (14), MSPW (91), VSPE (9), VSPW (92)



- Age: 1–2 yrs (88), 2–3 yrs (48), 3+ yrs (70)

Geographic Optimization

- Uneven distribution means a need for location-based clustering
- Visual grouping (manual) vs automated clustering (Haversine)
- ESR-based assignment for routing efficiency

