

# Gen AI for Mobile Workforce

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# Background



## BACKGROUND

# 13

### Divisions

Including power generation, transmission, distribution and power and water planning

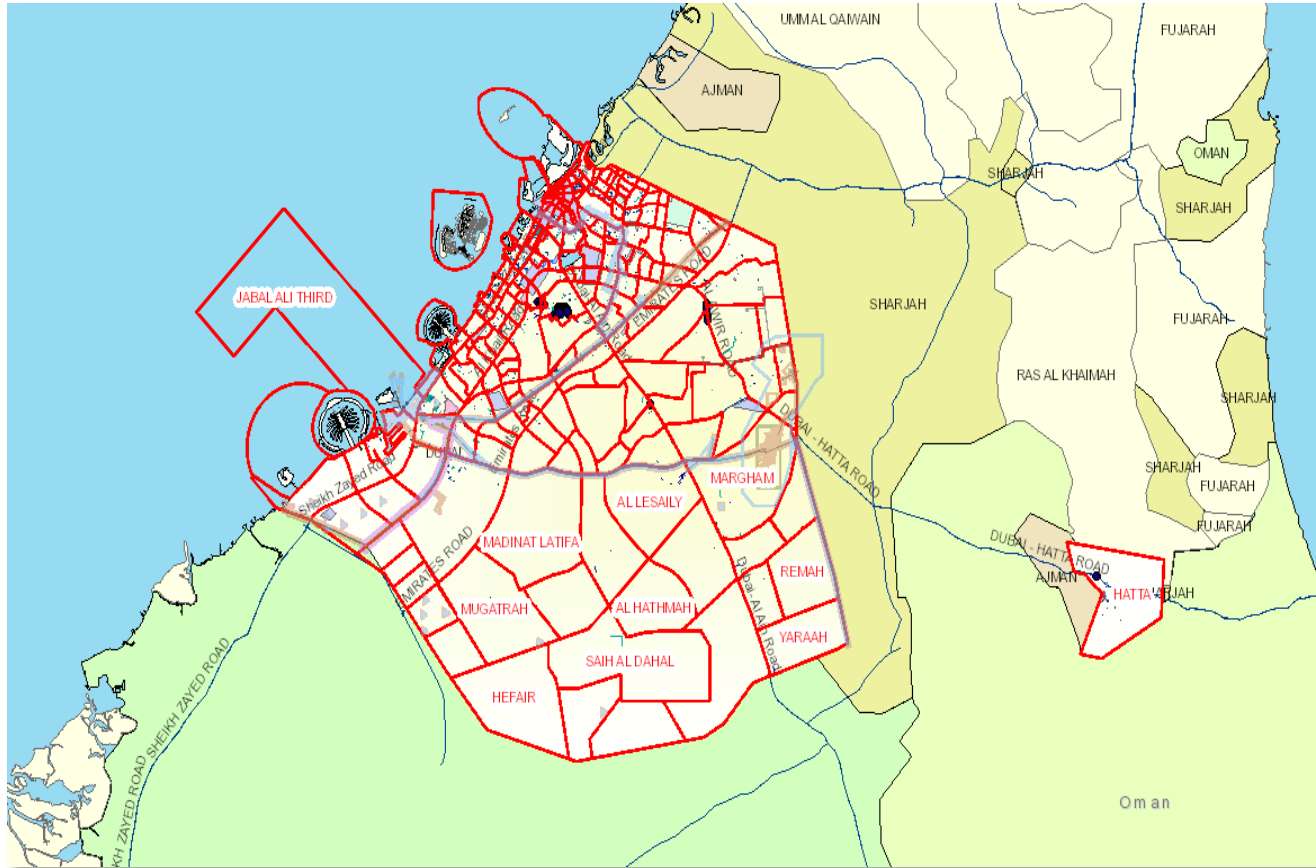
# 1.71

### Million

Number of Electricity customers in 2023



## BACKGROUND



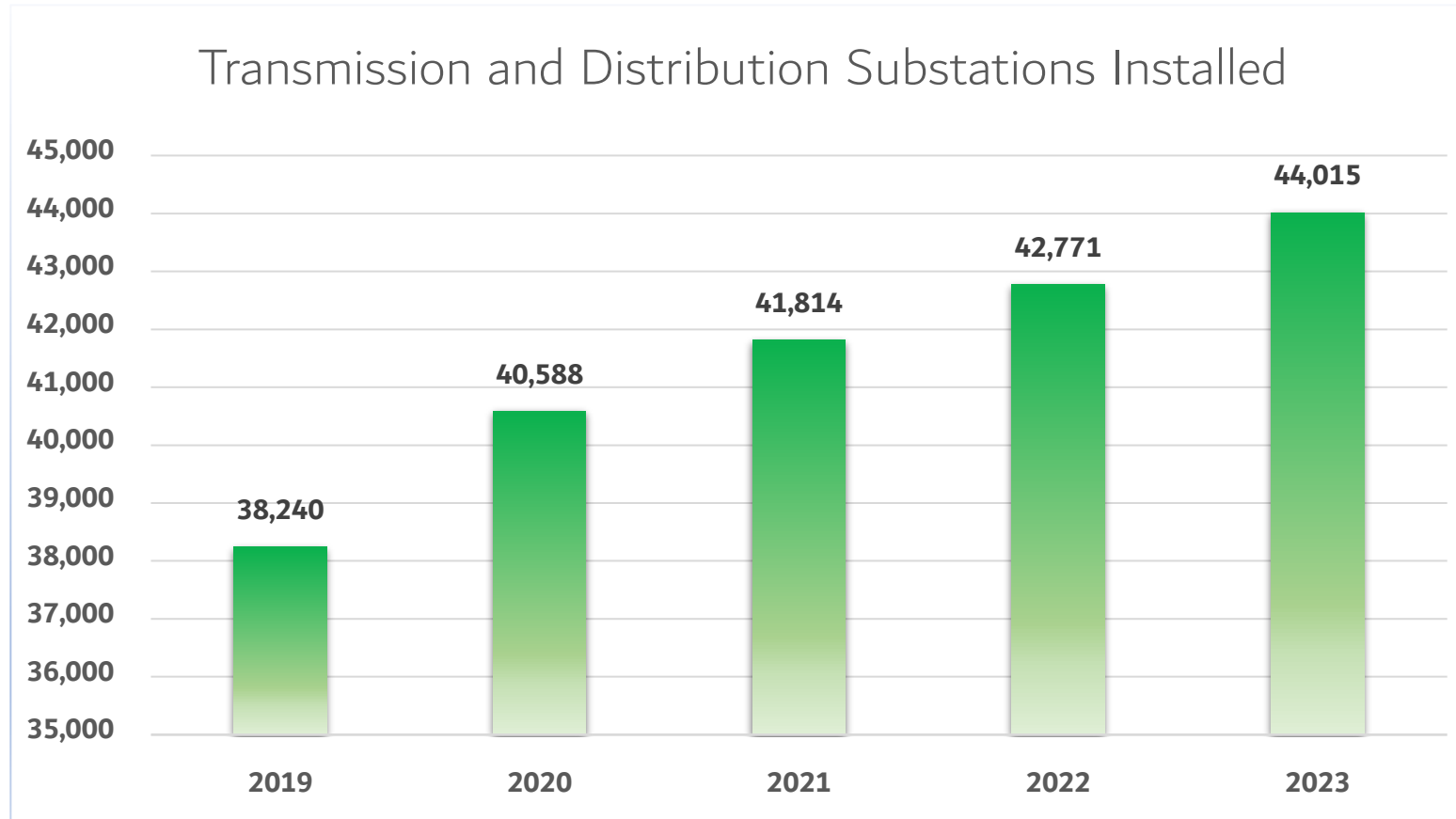
**42,586.71**  
km

Network coverage of  
transmission and  
distribution electricity lines  
(2022)

**56,516**  
GWh

Total Energy Requirements  
in Gigawatt hour (2023)

## BACKGROUND



**5,775**

New substations instated  
from 2019 to 2023

**15.1%**

Growth in infrastructure



## BACKGROUND

### Current Procedure

Manual inspection of substations where DEWA Field Operation (DFO) engineers complete checklists and enter data into the centralized system, a process that is **time-consuming, costly and error prone.**



**14+ Checklists conducted by Distribution Division alone**



**30 – 40 mins per inspected substation**



**+5 million AED cost per hour (2023)**

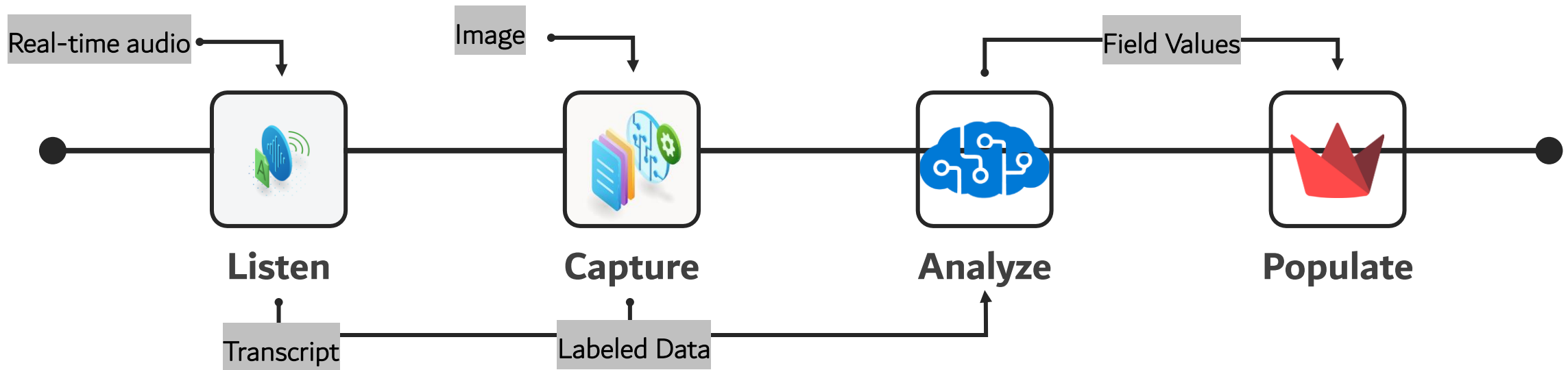
# Solution Proposal

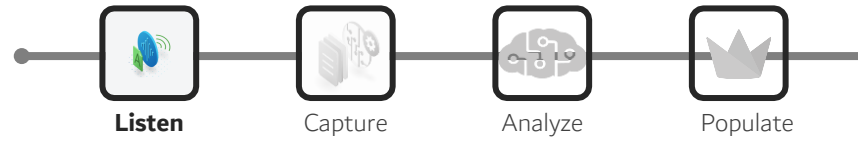


## SOLUTION PROPOSAL

**Automate substation inspection reporting** , utilize Artificial Intelligence driven solutions to enhance Operational Efficiency, optimize Asset Management, and reduce costs.

## SOLUTION PROPOSAL

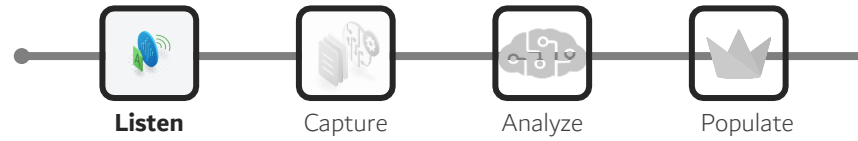




## SOLUTION PROPOSAL

**Azure Custom Speech AI model**, enables real-time transcription of audio using Advanced text to speech model.

- **Ensure contextual transcription:** Capture field-specific technical terminologies
- **Enhanced Audio Accuracy:** Accommodate various field conditions and background noise.
- **Dialect and Pronunciation Adaptation:** Accurate transcription of terms spoken with different accents and pronunciations.



# SOLUTION PROPOSAL **Azure Custom Speech AI model**

## Results based on Word Error rate (WER) calculation

Word Error Rate (WER) formula:

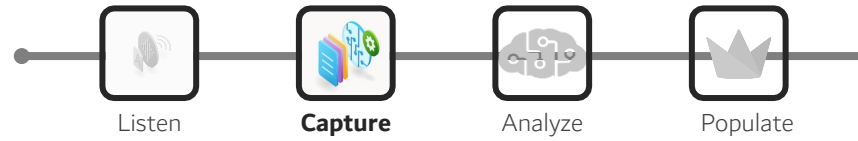
*Word Error Rate*

$$= \frac{\text{Insertions (I)} + \text{Deletions (D)} + \text{Substitutions (S)}}{\text{Number of words in reference (N)}} \times 100$$

Where:

- **Insertions (I):** Words inaccurately added in the hypothesis transcript.
- **Deletions (D):** Words missing in the hypothesis transcript.
- **Substitutions (S):** Words that differ between the reference and hypothesis transcripts.
- **Number of Words in Reference (N):** Total words in the human-labeled transcript.

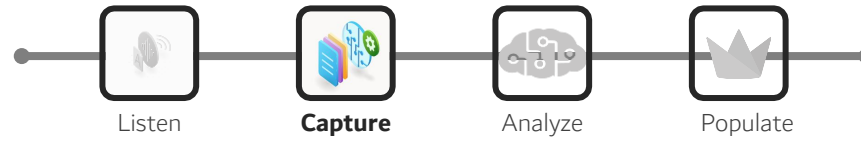
Data set	Base Model			Trained Model		
	Dataset 1	Dataset 1	Dataset 3	Dataset 1	Dataset 1	Dataset 3
No. of audio files	2	3	1	2	3	1
Word error rate (WER)	30.83%	20.62%	18.40%	31.67% ▲	17.54% ▼	13.60% ▼
Insertions	9.79%	7.38%	4.00%	12.29% ▲	8.00% ▲	4.80% ▲
Substitutions	17.71%	11.38%	11.20%	15.00% ▲	8.62% ▼	8.00% ▼
Deletions	3.33%	1.85%	3.20%	4.38% ▲	0.92% ▼	0.80% ▼



## SOLUTION PROPOSAL

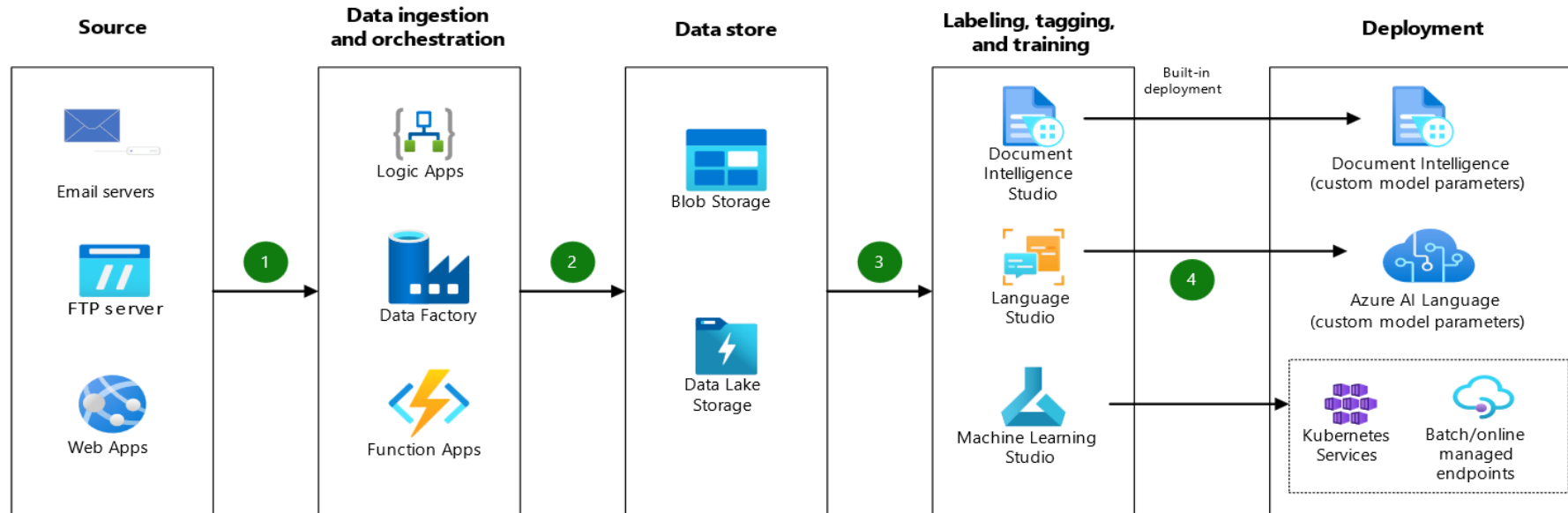
**Azure Document Intelligence Model** Automates image processing, analysis, and extraction through Optical Character Recognition (OCR) and machine learning.

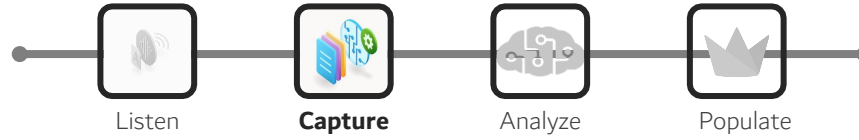
- **Custom Model Development:** Tailor models for optimized extraction based on unique characteristics.
- **Data Classification and Routing:** Route analyzed images to the appropriate custom extraction model.
- **Enhanced Accuracy and Efficiency:** Improve extraction accuracy using specialized models for each image type.



# SOLUTION PROPOSAL Azure Document Intelligence Model

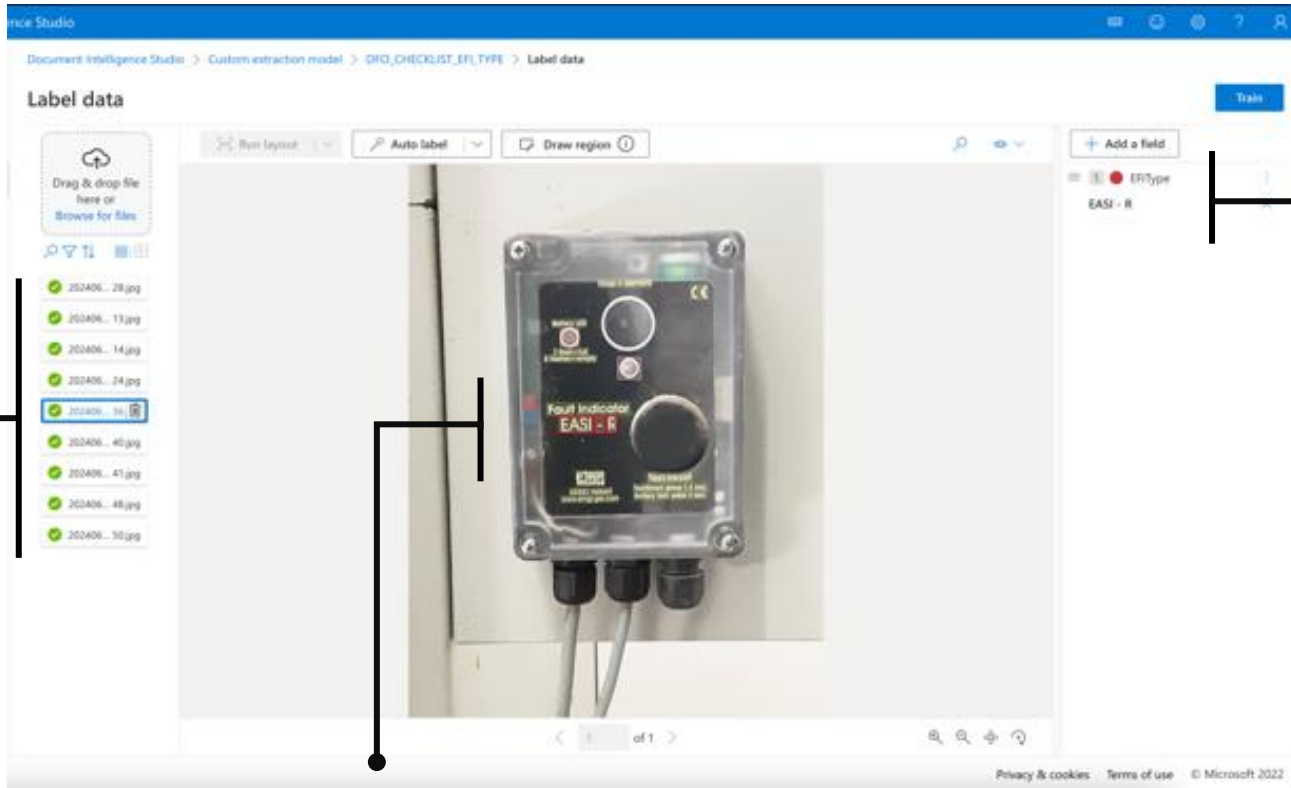
## Operational Workflow





# SOLUTION PROPOSAL Azure Document Intelligence Model

Data Extraction Results



Document Intelligence Studio - Custom extraction model -> DFO\_CHECKLIST\_EF\_TYPE -> Label data

Label data

Drag & drop file here or Browse for files

- 202406... 28.jpg
- 202406... 13.jpg
- 202406... 14.jpg
- 202406... 24.jpg
- 202406... 31.jpg
- 202406... 40.jpg
- 202406... 41.jpg
- 202406... 48.jpg
- 202406... 50.jpg

EFType

EASIR

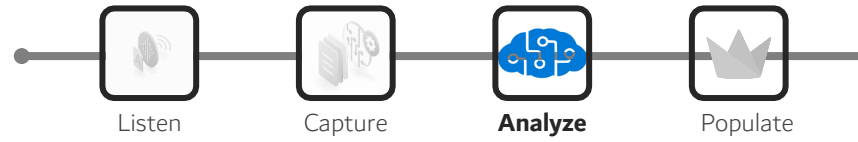
Recognized Value

Customized Model confidence score

Field Name	Accuracy
EFType	99.50 %
RmuMake	99.50 %
SubStationNumber	99.50 %
TRANSFORMER_MAKE	99.50 %
TRANSFORMER_CAPACITY	99.50 %

Training Datasets

Label Position



## SOLUTION PROPOSAL

**Azure AI Cognitive Language Model** leverages advanced natural language processing techniques to accurately detect and to extract data from unstructured text.

- **Named Entity Recognition (NER):** Extract, analyze and categorized data from written text.
- **Domain-Specific Customization:** Trained model to recognize domain specific entities, map and extract the data relevant from the generated audio transcription.

# SOLUTION PROPOSAL Azure AI Cognitive Language Model

## Schema Labeling

### Original text

I am performing the inspection of Substation 58763 M. The Ambient temperature is 31°C. We have a subst... Ambient\_temperature

MERLIN RMU here, which is non extensible and has six functions. The insulating medium is oil, and RMU\_make Number\_of\_f... Insulating\_medium

**Labeled schema**

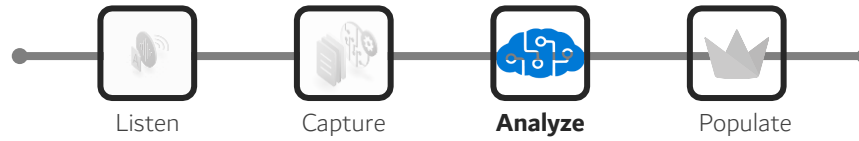
i.e. RMU type

**Text Value**

i.e. non-extensible

## Example Schema

- Substation\_Number
- Ambient\_Temperature
- RMU\_Make
- RMU\_Type
- Operating\_Handel\_Availability
- Number\_of\_Functions
- Insulating\_Medium
- Transformer\_Make
- Transformer\_Capacity
- LVDB\_Make
- LVDB\_Connection



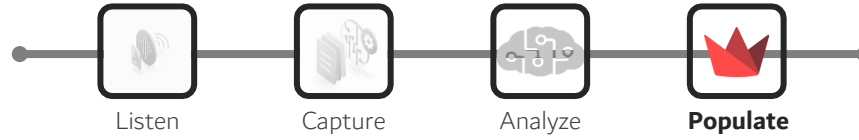
# SOLUTION PROPOSAL Azure AI Cognitive Language Model

## Data Extraction Results

Language Studio > Custom Named Entity Recognition > Key\_Phase\_Test - Testing deployments

Show cards  On   Sort   Filter

<p><u>substation_number</u></p> <p>Entity value: 58763 M Confidence: 100.00%</p>	<p><u>Ambient_temperature</u></p> <p>Entity value: Ambient temperature is 31°C Confidence: 100.00%</p>	<p><u>RMU_make</u></p> <p>Entity value: MERLIN RMU Confidence: 100.00%</p>	<p><u>RMU_type</u></p> <p>Entity value: non extensible Confidence: 100.00%</p>	<p><u>Number_of_functions</u></p> <p>Entity value: six functions Confidence: 100.00%</p>
<p><u>Insulating_medium</u></p> <p>Entity value: insulating medium is oil Confidence: 100.00%</p>	<p><u>sound</u></p> <p>Entity value: sound is abnormal Confidence: 100.00%</p>	<p><u>Operating_handle_availability</u></p> <p>Entity value: Operating handle is available Confidence: 100.00%</p>	<p><u>Live_line_indicator</u></p> <p>Entity value: live line indicator is OK Confidence: 100.00%</p>	<p><u>Position_indicator</u></p> <p>Entity value: position indicator is OK Confidence: 99.00%</p>
<p><u>RMU_labeling</u></p> <p>Entity value: RMU labeling is not available Confidence: 100.00%</p>	<p><u>RMU_temperature</u></p> <p>Entity value: temperature is Normal Temp Confidence: 100.00%</p>	<p><u>EFI_status</u></p> <p>Entity value: EFI is healthy Confidence: 99.00%</p>	<p><u>EFI_type</u></p> <p>Entity value: EFI type is Earth 4,0 Confidence: 100.00%</p>	<p><u>RTU_selector_switch</u></p> <p>Entity value: RTU selector switch is on remote Confidence: 100.00%</p>
<p><u>RTU_Labeling</u></p> <p>Entity value: RTU labeling is not available Confidence: 100.00%</p>	<p><u>Earthing_status</u></p> <p>Entity value: Equipment Earthing is not available Confidence: 100.00%</p>	<p><u>transformer_make</u></p> <p>Entity value: transformer make is TEBIAN Confidence: 100.00%</p>	<p><u>transformer_capacity</u></p> <p>Entity value: capacity is 1500 KVA Confidence: 100.00%</p>	<p><u>transformer_type</u></p> <p>Entity value: type is cast resin transformer Confidence: 81.00%</p>



# SOLUTION PROPOSAL

## Report Generation

```

{
  "rmu": {
    "SubStationNumber": "SS17874A"
    "RmuMake": "COL S.p.a."
  }
}
  
```

Document has been processed successfully

The document\_path  
is: /Users/prasanthmathavan/DDrive/D/Robotics/VSCoDe/DocumentIntelligence/upload/transformer\_name\_capacity1.jpg, document\_type is: transformer\_type and confidence is: 0.803

```

{
  "transform": {
    "TRANSFORMER_MAKE": "Tesar"
    "TRANSFORMER_CAPACITY": "1500"
  }
}
  
```

Document has been processed successfully

The document\_path  
is: /Users/prasanthmathavan/DDrive/D/Robotics/VSCoDe/DocumentIntelligence/upload/efi.jpg, document\_type is: efi\_type and confidence is: 0.857

```

{
  "efi": {
    "efi_type": "EASI - R"
  }
}
  
```

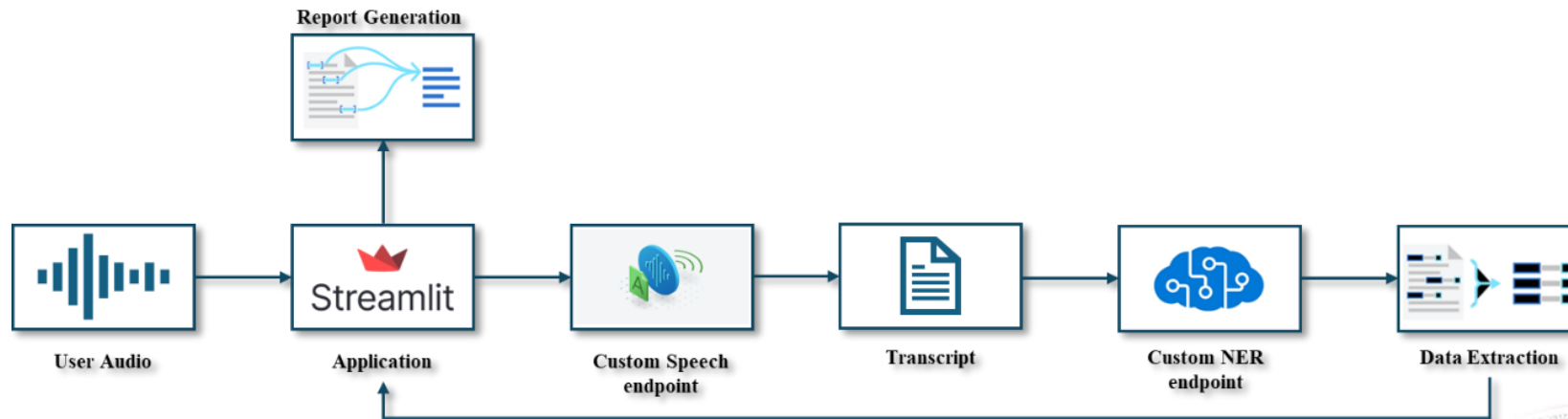
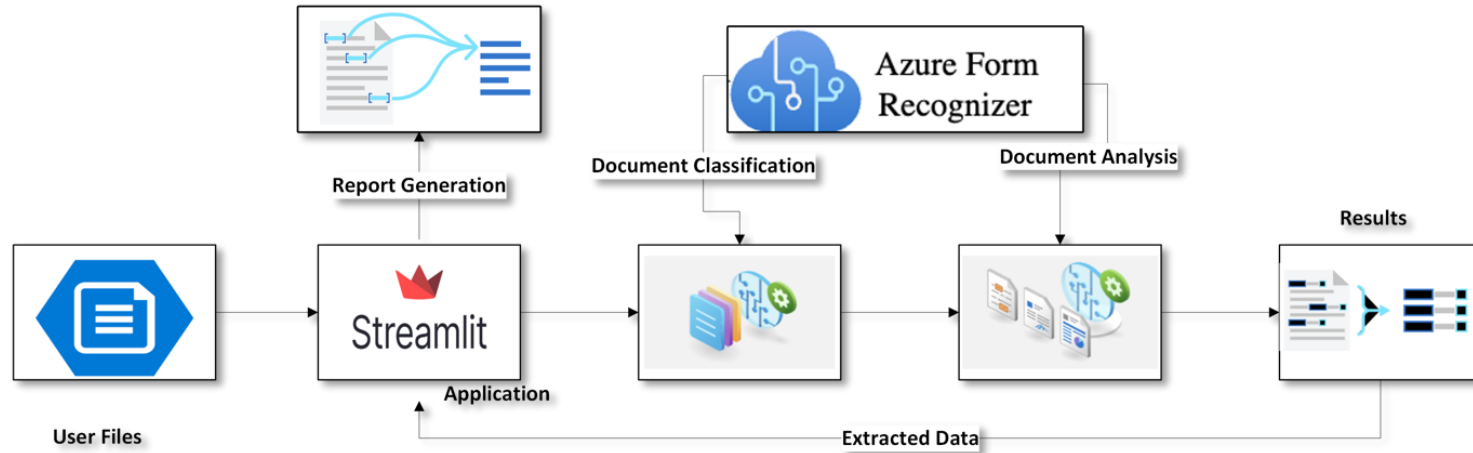


SS Inspection Checklist  
 RMU Inspection  
 01. SUBSTATION NO.   
 02. RMU Make   
 03. EFI Type.   
 Transformer #1: Inspection  
 01. Transformer Type.   
 02. Transformer Make.

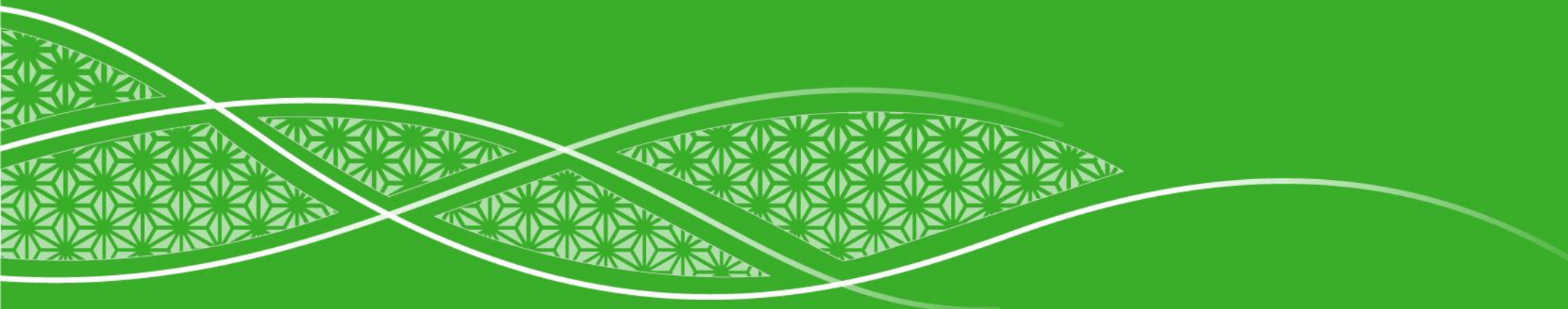


SS Inspection Checklist  
 RMU Inspection  
 01. SUBSTATION No:   
 02. Ambient Temp:   
 03. RMU Make:   
 04. Type:   
 05. No. of functions:

# MODEL ARCHITECTURE



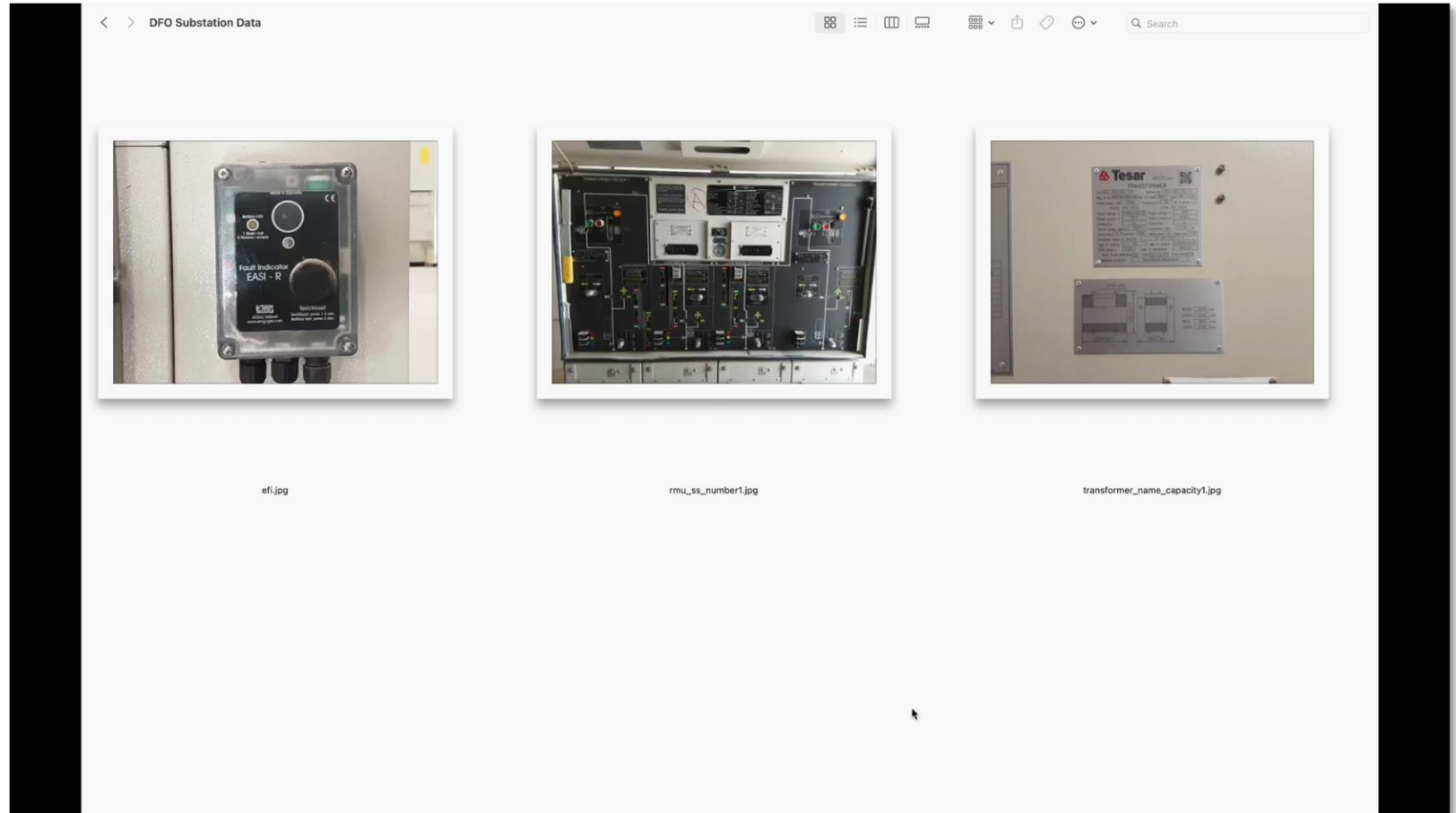
# DEMO



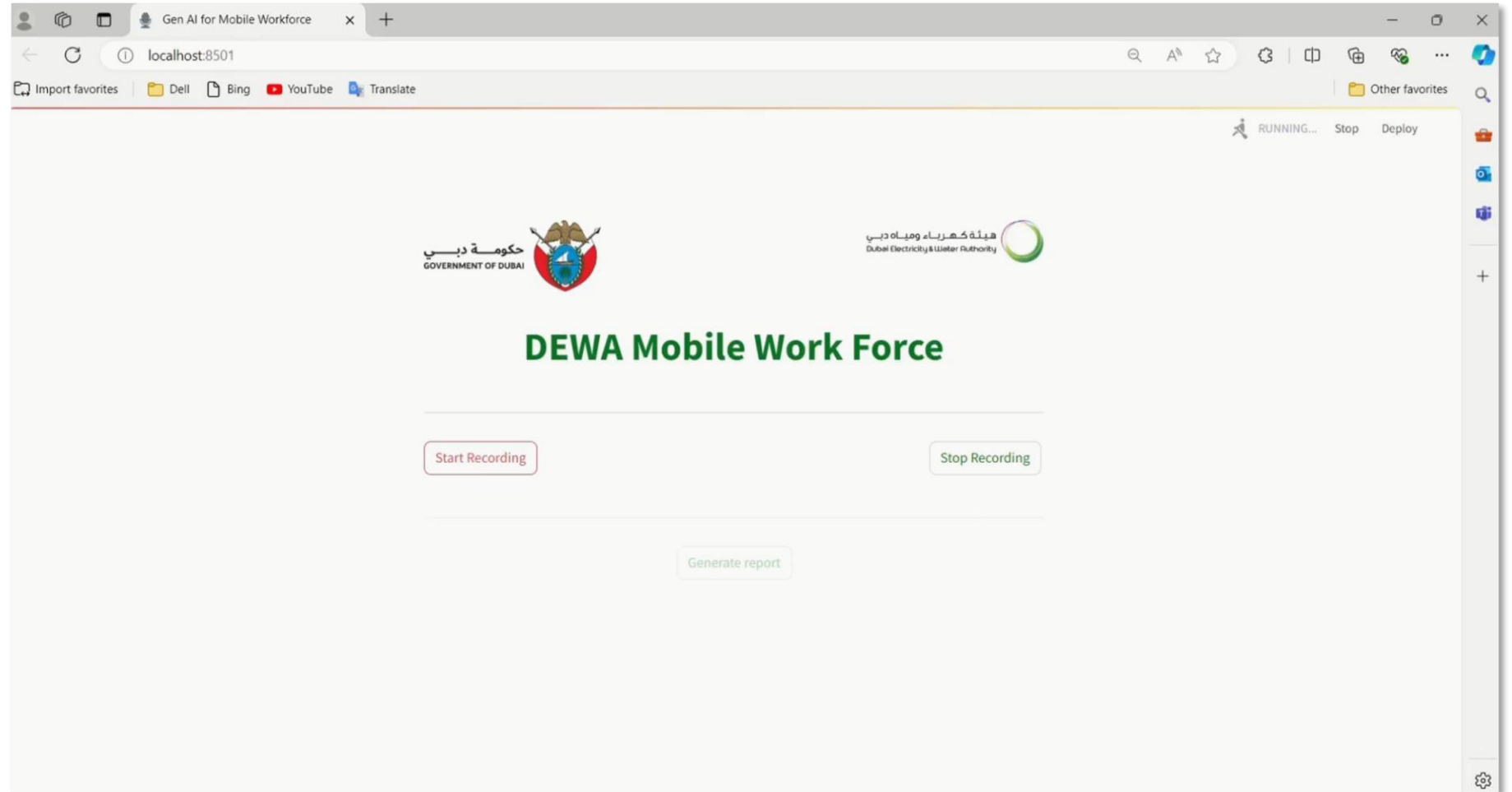
## DEMO



# DEMO



# DEMO



# Results



## EXPECTED IMPACT



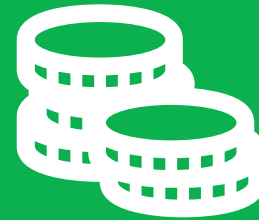
**30%**

Reduction in task completion time



**Asset Optimization**

Improved asset allocation



**5,9 Million AED**

Cost saving through improved process efficiency



**Improved experience**

Streamline reporting process and reduce manual effort



**THANK YOU**

