Electricity Price Prediction Analysis-Phase 4

1. Introduction

This comprehensive report delves into the process of predicting electricity prices using machine learning methodologies. Precise price forecasting is integral for utility management, trade decisions, and efficient cost control.

2. Dataset Description and Feature Engineering

The dataset utilized for this analysis encompasses an array of factors pertinent to electricity price prediction such as system loads, weather variables, fuel costs, reserve margin, scheduled maintenance, and forced outages. Feature engineering involves data preprocessing and selection to prepare for model training.

```
Python code:

# Loading and Preprocessing the Dataset with Feature Engineering
import pandas as pd

from sklearn.model_selection import train_test_split

data = pd.read_csv('electricity_data.csv')

# Perform feature engineering and preprocessing

#...

# Feature selection and dataset split

features = data[['System_Loads', 'Weather_Variables', 'Fuel_Costs', 'Reserve_Margin', 'Maintenance', 'Forced_Outages']]

target = data['Electricity_Price']

X_train, X_test, y_train, y_test = train_test_split(features, target, test_size=0.2, random_state=42)
```

3. Model Training using RandomForestRegressor

The RandomForestRegressor is utilized due to its capability to handle complex relationships and non-linear patterns in the dataset. The model is trained on the training set.

Python code:

from sklearn.ensemble import RandomForestRegressor

```
model = RandomForestRegressor()
model.fit(X train, y train)
```

4. Evaluation and Performance Metrics

The model's performance is evaluated using Mean Squared Error (MSE), a common regression metric that measures the average squared difference between predicted and actual values.

Python code:

```
from sklearn.metrics import mean_squared_error
y_pred = model.predict(X_test)
mse = mean_squared_error(y_test, y_pred)
print(f"Mean Squared Error: {mse}")
```

5. Model Analysis and Results

Model predictions are obtained, and an adjustment based on the Mean Squared Error (MSE) is applied to yield an understanding of the adjusted predicted prices.

Python code:

```
# Adjusted Predicted Prices based on MSE
adjusted_predicted_prices = y_pred + mse
print("Adjusted Predicted Electricity Prices:", adjusted predicted prices)
```

6. Visualization and Interpretation

A line plot is generated to visualize the Adjusted Predicted Electricity Prices for further interpretation.

```
Python code:
import matplotlib.pyplot as plt
plt.figure(figsize=(8, 6))
plt.plot(adjusted_predicted_prices, label='Adjusted Predicted Prices')
plt.title('Adjusted Predicted Electricity Prices')
plt.xlabel('Data Points')
plt.ylabel('Adjusted Predicted Prices')
```

```
plt.legend()
plt.show()
```

Program code

electricityprice.py

```
import pandas as pd
from sklearn.model_selection import train_test_split, GridSearchCV
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error
import matplotlib.pyplot as plt
# Load the dataset
data = pd.read_csv('electricity_data.csv') # Replace 'electricity_data.csv'
with your dataset
# Drop non-numeric columns or unwanted columns (like 'Date')
data = data.select dtypes(exclude=['object']) # Selects only numeric columns
# Feature selection
features = data.drop('Electricity_Price', axis=1) # Excluding the target
variable
target = data['Electricity_Price']
# Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(features, target,
test_size=0.2, random_state=42)
# Define the parameter grid to search
param_grid = {
    'n_estimators': [50, 100, 150], # Vary the number of trees in the forest
    'max_depth': [None, 10, 20], # Vary the maximum depth of the trees
    # Add more parameters for exploration if required
# Model training with GridSearchCV
model = RandomForestRegressor()
grid search = GridSearchCV(model, param_grid,
scoring='neg_mean_squared_error', cv=5)
grid_search.fit(X_train, y_train)
# Best parameters found by GridSearchCV
best_params = grid_search.best_params_
print("Best Parameters:", best_params)
# Get the best model
```

```
best_model = grid_search.best_estimator_

# Model evaluation
y_pred = best_model.predict(X_test)
mse = mean_squared_error(y_test, y_pred)
print(f"Mean Squared Error after Optimization: {mse}")

# Print the first 10 predicted prices
print("Predicted Electricity Prices:", y_pred[:10])

# Visualization of Predicted Prices
plt.figure(figsize=(8, 6))
plt.plot(y_test.values, label='Actual Prices')
plt.plot(y_pred, label='Predicted Prices')
plt.title('Electricity Price Prediction')
plt.xlabel('Data Points')
plt.ylabel('Electricity Prices')
plt.legend()
plt.show()
```

Data set:

	Electricity	System_	Weather_V	Fuel_C	Reserve_	Scheduled_Mai	Forced_O
Date	_Price	Loads	ariables	osts	Margin	ntenance	utages
#####				39.259			
###	49.96321	934	0.091002	33	24	0	1
#####				93.040			
###	96.05714	676	0.726397	06	10	0	0
#####				78.385			
###	78.55952	516	0.547446	53	16	1	0
#####				77.822			
###	67.89268	267	0.45091	87	-45	1	1
#####				87.580			
###	32.48149	941	0.910471	87	-42	0	0
#####				67.076			
###	32.47956	142	0.297959	32	-45	1	0
#####				87.053			
###	24.64669	655	0.523602	81	22	0	0
#####				64.866			
###	89.29409	384	0.697642	35	44	0	0
#####				34.702			
###	68.0892	496	0.796472	28	-19	0	0
#####				58.367			
###	76.64581	111	0.459347	37	-10	1	0
#####				64.822			
###	21.64676	706	0.842091	54	25	1	0
#####				80.414			
###	97.59279	401	0.768918	18	-43	0	0

#####				37.460			
###	86.59541	997	0.066236	51	21	0	1
#####				39.801			
###	36.98713	352	0.045861	3	-1	0	1
#####				48.457			
###	34.546	598	0.620806	87	41	0	1
#####				48.654			
###	34.67236	853	0.347413	89	11	0	0
#####				81.252			
###	44.33938	134	0.209131	92	33	1	0
#####				47.551			
###	61.98051	826	0.57965	15	11	0	1
#####				74.316			
###	54.5556	948	0.341563	86	-44	1	1
#####				64.599			
###	43.29833	189	0.537263	17	24	0	1
#####				70.130			
###	68.94823	875	0.460119	61	33	1	0
#####				88.667			
###	31.15951	704	0.584766	49	29	1	1
#####				58.306			
###	43.37157	701	0.4003	71	-47	1	1
#####				83.963			
###	49.30895	517	0.697668	8	-45	1	0
#####				59.542			
###	56.4856	214	0.180067	52	7	1	1
#####							
###	82.81408	716	0.696501	54.771	-29	1	0
#####				97.103			
###	35.9739	295	0.411661	9	-25	0	0
#####				42.905			
###	61.13876	925	0.874318	96	-48	1	0
#####				36.323			
###	67.39317	600	0.515236	59	-10	0	1
#####				83.969			
###	23.71603	725	0.97311	01	9	1	1
#####				34.777			
###	68.60359	592	0.601935	48	-37	1	0
#####				88.595			
###	33.64193	174	0.223849	53	24	0	1
#####				60.603			
###	25.20413	512	0.821791	54	31	1	1
#####				94.085			
###	95.91084	475	0.345083	96	-39	0	1
#####				80.507			
###	97.25056	519	0.347619	3	36	0	1
#####				72.728			
###	84.67179	828	0.031805	33	-39	0	0
#####				96.451			
###	44.3691	376	0.548715	48	-38	0	1

#####				57.765			
###	27.81377	860	0.534424	46	-26	1	0
#####				96.786			
###	74.73864	775	0.355991	09	-6	1	0
#####				39.450			
###	55.2122	493	0.894217	09	-32	0	1
#####				63.862			
###	29.76306	968	0.128748	85	4	1	0
#####				48.893			
###	59.61415	556	0.3301	79	49	1	1
#####				67.788			
###	22.75108	291	0.321583	99	-6	0	1
#####				41.340			
###	92.74563	838	0.092291	97	-43	1	0
#####				88.907			
###	40.7024	788	0.481145	08	42	0	0
#####				89.248			
###	73.00178	198	0.687785	55	2	0	0
#####				96.866			
###	44.93689	647	0.511657	54	4	1	0
#####				40.827			
###	61.60544	195	0.156978	05	-19	1	1
#####				73.633			
###	63.73682	763	0.377286	28	0	1	1
#####				63.196			
###	34.78836	762	0.002595	61	-7	0	1
#####				54.106			
###	97.56677	289	0.868301	86	31	0	0
#####				54.607			
###	82.01063	835	0.084517	81	19	1	0
#####				58.895			
###	95.15992	136	0.597278		-33	1	0
#####				79.344			
###	91.58619	879	0.986257	79	32	1	1
#####				71.880			
###	67.832	468	0.536591	02	-29	1	0
#####				62.177		_	
###	93.74994	794	0.924042	71	-14	0	1
#####				35.315			
	27.0794	624	0.236117	34	45	1	0
#####				35.443	_	_	
###	35.67863	378	0.759955	57	5	0	1
#####	00.01010	246	0.501066	30.163		•	
###	23.61818	316	0.531266	76	8	0	1
#####	46.00640	000	0.720546	97.738	40		_
###	46.02643	966	0.720516	96	-48	1	0
#####	E4 00 440	072	0.000044	30.367	22		_
###	51.09418	972	0.062341	77	-23	1	0
#####	44 70702	007	0.447720	37.216	22	4	4
###	41.70792	897	0.147739	56	23	1	1

#####				52.021				
###	86.299	372	0.133117	76	-16	0	1	
#####				86.520				
###	48.54027	980	0.687166	12	10	1	0	
#####				97.346				
###	42.47476	161	0.844441	92	42	1	0	
#####				85.300				
###	63.41569	695	0.749616	95	3	0	1	
#####				78.339				
###	31.27394	979	0.030472	22	12	1	0	
#####				66.491				
###	84.17576	828	0.867215	05	28	0	1	
#####				36.069				
###	25.96405	441	0.354147	36	46	1	1	
#####				97.071				
###	98.95095	496	0.397164	96	-44	0	0	
#####				83.087				
###	81.77958	798	0.104869	47	25	1	0	
#####				74.726				
###	35.89725	118	0.737405	46	-2	1	0	
#####				83.132				
###	20.44177	276	0.182284	51	43	0	0	
#####				80.687				
###	85.23691	711	0.563965	23	34	0	0	
#####				74.606				
###	76.54859	495	0.84071		-20	1	1	
#####				98.640				
###	78.32057	544	0.089204		7	0	1	
#####				93.235		_	_	
###	81.70163	332	0.535336		10	0	0	
#####				75.266		•		
###	25.92357	1/5	0.233216		-27	0	0	
#####	40.67726	264	0.242027	78.522	24	2	0	
###	48.67726	364	0.342927	26	-31	0	0	
#####	20.20052	F F 4	0.47207	33.611	1.4	1	4	
###	29.26952	554	0.47397	71 76 804	-14	1	1	
##### ###	90 04927	895	0.355104	76.894 22	-47	1	0	
#####	89.04827	695	0.555104	33.091	-47	1	U	
###	69.86385	817	0.648823	53.091	41	0	0	
#####	03.80383	817	0.040023	71.178	41	U	U	
###	46.47184	834	0.479582	46	-31	0	1	
#####	40.47104	054	0.473302	99.954	31	O .	-	
###	25.08467	483	0.584199	74	9	0	1	
#####	23.33 107	100	0.50 1155	68.906	3	Ŭ	-	
###	44.87859	663	0.736822	46	-27	0	0	
#####	11107 000		5 5.5522	63.124	<u> </u>	-	-	
###	46.01467	950	0.557742		-1	1	0	
#####		-	- · · -	51.899	_		-	
###	78.36849	605	0.586535		-2	1	0	

#####				38.436			
###	71.0046	466	0.564459	58	0	0	1
#####				81.171			
###	90.97702	243	0.378773	66	45	0	0
#####				43.481			
###	57.77719	984	0.337447		-15	0	0
#####				38.069			
###	29.56754	168	0.899647		47	1	0
#####				59.523			
###	77.05958	198	0.607555		49	0	1
#####				85.673			
###	80.8628	495	0.244353	93	15	1	1
#####				82.154			
###	64.90218	124	0.498248	52	28	0	0
#####				33.841			
###	81.67737	990	0.330348	78	-17	1	0
#####				61.860			
###	59.50365	568	0.933692	06	-15	0	1
#####				66.570			
###	61.81863	583	0.007534	42	-45	1	1
#####				75.118			
###	54.20328	664	0.225333		-12	0	1
#####				75.511			
###	22.03353	250	0.365357	71	-9	0	1
#####				55.528			
###	28.63131	243	0.48781	81	7	0	1
#####				69.247			
###	22.51433	668	0.850818	4	-39	1	1
#####				63.674			
###	70.91283	138	0.087888	33	-48	0	1
#####				91.949			
###	45.14848	208	0.805865	88	-33	1	1
#####				67.118			
###	60.68566	792	0.055653	56	-11	1	1
#####				60.872			
###	92.60532	141	0.842314	25	-30	0	0
#####				58.313			
###	39.94338	285	0.051635	98	-36	0	0
#####				70.069			
###	52.83063	497	0.018242	94	46	0	0
#####				86.278			
###	80.44409	322	0.696961	39	48	1	1
#####				67.688			
###	38.30385	733	0.997256	1	-25	0	0
#####				76.315			
###	26.15839	232	0.89661	86	-43	1	1
#####				81.649			
###	43.18012	262	0.575998	9	49	1	1
#####				66.411			
###	32.8977	314	0.917396	77	43	0	0

#####				59.877			
###	94.37581	832	0.0053	19	36	0	1
#####				91.366			
###	84.64963	334	0.975067	58	-9	0	0
#####				59.225			
###	70.6723	942	0.490749	43	-7	0	0
#####							
###	89.71685	757	0.722896	62.336	-37	0	0
#####				99.323			
###	84.29377	850	0.820861	89	27	0	1
#####				30.016			
###	34.9256	687	0.718457	63	-49	1	0
#####				42.983			
###	91.40472	108	0.535037		-14	1	1
#####				56.877			
###	63.14738	173	0.476619		18	1	0
#####				95.281			
###	84.59521	591	0.838583		-13	0	0
#####	04 60=0	252		34.902		_	
	91.6873	352	0.205078		-10	1	0
#####	45 44020	220	0.067004	30.663	4.4	4	4
	45.44028	329	0.967994		11	1	1
#####	20 00415	C10	0.710053	33.687	0	1	1
### #####	28.80415	618	0.710952	87 36.198	9	1	1
###	38.23481	273	0.199507		-37	1	1
#####	36.23461	2/3	0.133307	32.631	-57	1	1
###	54.16862	752	0.736247		38	1	0
#####	34.10002	732	0.730247	63.584	30	-	U
###	85.44118	267	0.52984		33	0	0
#####						•	-
###	88.85845	269	0.70723	70.653	-49	0	1
#####				49.018			
###	20.55617	492	0.76778	09	19	1	1
#####				57.880			
###	60.85978	894	0.08729	12	-34	1	1
#####				36.418			
###	53.39288	733	0.506104	95	38	1	1
#####				53.545			
###	37.76862	293	0.932014	93	-23	0	1
#####				66.576			
###	29.58923	616	0.320642		15	0	1
#####				81.259			_
###	47.00921	128	0.593883		-16	1	0
#####	05 40070	264	0.0000	30.234	4.6	•	4
###	95.43278	264	0.36923		-46	0	1
#####	4E 0EC22	F24	0.454260	62.711	1.4	0	0
### #####	45.85623	521	0.454268	75 50.790	14	0	0
#### ###	61.50325	438	0.548603		-11	1	0
समा	01.30323	420	0.540003	۷	-11	1	U

#####				89.697			
###	76.24152	747	0.548922		25	0	1
#####				80.088			
###	49.09037	595	0.20173	73	5	0	1
#####				71.237			
###	97.74257	464	0.684572	6	-15	1	0
#####				49.408			
###	96.99578	932	0.087868	6	-6	0	1
#####				93.723			
###	40.14258	441	0.138825		-28	0	1
#####				33.157			
###	59.77988	599	0.002711	05	-4	1	0
#####				37.662		_	_
###	44.07026	756	0.116696	73	-20	0	0
#####				57.414		_	_
###	42.78724	610	0.473166	11	-40	0	0
#####				38.710			
###	22.95096	426	0.606102		-41	1	1
#####	60 =6=4=	246		96.949	4.0		_
###	68.76515	316	0.794289	1	16	1	0
#####	60 24 422	400	0.406600	85.859	27		_
###	60.21432	400	0.106699	25	-37	1	1
#####	244402	224	0.050707	48.128	20		•
	24.1183	231	0.850727	79 74 400	29	0	0
#####	42 20172	002	0.745075	71.198	22	1	^
###	42.29172	903	0.745975		23	1	0
#####	02.66127	1.00	0.400540	98.763	42	0	^
###	92.66127	169	0.408518	14	42	0	0
##### ###	39.16495	351	0.932938	91.893 93	-41	1	1
#####	33.10433	331	0.932936	72.055	-41	7	1
###	31.59159	514	0.990929	72.033 89	25	0	1
#####	31.39139	314	0.990929	93.260	25	U	_
###	59.15622	886	0.205002	68	43	1	0
#####	33.13022	880	0.203002	99.242	43	1	U
###	98.85204	544	0.379229	94	-50	1	0
#####	30.03204	344	0.373223	82.034	30	-	Ü
###	39.36442	975	0.926449	7	-46	1	0
#####	33.30112	373	0.520115	34.549	10	-	Ŭ
###	73.77084	281	0.721597	05	-31	1	1
#####	73177331	201	0.721337	58.110	31	-	_
###	80.92957	266	0.048095	62	-43	0	0
#####	00.0_00.		0.0.000	88.647	.0	•	
###	39.011	190	0.781514	8	-8	1	1
#####		-		46.139	-	-	_
###	78.25731	813	0.827941	84	25	1	0
#####	- 	- -		88.144	-		-
###	49.42265	957	0.750502	98	-50	0	0
#####				38.423			
###	70.58447	630	0.799537	71	6	1	0

#####				33.286			
###	70.68238	138	0.825133	18	13	0	0
#####				56.886			
###	62.86197	225	0.186405	34	33	1	0
#####				32.571			
###	27.22318	550	0.235692	24	-23	1	0
#####				97.008			
###	86.8242	272	0.633759	92	-14	1	1
#####				87.834			
###	45.66241	752	0.907866	4	-4	0	0
#####				86.053			
###	34.92148	853	0.316197	88	25	1	1
#####				74.084			
###	23.26201	319	0.588307	45	-14	1	0
#####				45.142			
###	67.27144	737	0.682982	68	-2	1	0
#####				66.278			
###	74.20515	157	0.451949		-7	0	1
#####				71.809			
###	21.32703	759	0.713782		5	0	0
#####				66.752			
###	60.96744	575	0.899667		-23	1	1
#####				48.216			
###	38.11966	555	0.624102		28	0	1
#####				66.067			_
###	71.61382	928	0.539781		-45	1	0
#####				64.383			
###	33.94931	994	0.438745		10	1	1
#####		450		99.743	•	•	
###	75.27502	460	0.577486	5	-31	1	1
#####	50.00000	400	0.055060	92.820	27		•
###	50.93883	100	0.355362		27	1	0
#####	04.0004	406	0 004 400	62.436	40		
###	94.9384	486	0.391482	65	-49	1	1
#####	24 00460	4.47	0.534057	73.605	22	4	^
###	31.00168	447	0.531857	62	22	1	0
#####	47 20524	200	0.000010	82.351	1.4	1	^
###	47.28531	289	0.066619	01	-14	1	0
#####	20.07700	CO4	0.220025	32.440	21	0	^
###	29.07788	604	0.229025	56	-31	0	0
#####	02.07540	200	0.543940	92.644	25	0	0
###	93.97549	290	0.542849	5	-25	0	U
##### ###	90.18715	607	0.421520	90.208 88	-22	0	1
	90.16/15	607	0.431528		-22	0	1
##### ###	40 E2E22	468	ე ეეეი1 <i>6</i>	62.020 25	-50	0	0
	40.63533	408	0.332816	25 57.381	-30	U	U
##### ###	72.79872	508	0.730549	57.381 88	-16	0	0
#####	12.13012	300	0.730349	49.107	-10	U	U
###	85.37778	923	0.693718	49.107	19	0	1
###	03.37770	323	0.033710	10	13	U	Т

#####				63.367				
###	64.41606	216	0.166731	38	8	() ()
#####				33.106				
###	62.37205	233	0.878629	37	18	-	1 0)
#####				89.653				
###	39.34818	157	0.495424		-18	•	1 1	_
#####				32.479				
###	27.44822	655	0.741461		0	•	1 1	
#####			0.7	53.033	•		_	-
###	91.77726	784	0.573151		27		1 1	
#####	31.77720	,	0.070101	95.211	_,	•	_	_
###	92.03344	771	0.997693		-39	() 1	1
#####	32.03311	,,_	0.557055	81.464	33	`	_	-
###	70.64812	272	0.752403		-31	() 1	1
#####	70.04012	272	0.732403	49.697	31	`	, .	_
###	47.12238	028	0.70698	37	2		1 1	ı
#####	47.12230	920	0.70036	47.685	۷	-	L _	_
###	47.93677	914	0.778572		37	,	1 1	ı
#####	47.33077	914	0.776372	30.355	37	-	L J	_
	79 07645	240	0.143128		o	,		`
###	78.07645	248	0.143128	/5	-8	() (,
#####	04 76002	470	0.204545	70.7	47	,		ı
###	91.76882	179	0.204545		47	-	l 1	<u>.</u>
#####	00.05504	005	0.74.4064	33.414	20			1
###	90.96691	985	0.714064		38	-	1	L
#####	02 20004	242	0.400004	67.282				
###	82.39004	312	0.493981		-1	-	1 1	<u> </u>
#####				97.348			_	
###	71.36253	302	0.754635		-22	-	1 C)
#####				37.662	_		_	
###	26.7312	863	0.102916		6	() ()
#####				92.613				
	32.9303	328	0.536481		-12	-	1 1	L
#####				99.403				
###	91.88434	775	0.378822	27	44	=	1 1	_
#####				34.306				
###	68.51432	326	0.457		5	() 1	_
#####				91.803				
###	20.73576	758	0.603958		-8	() ()
#####				66.125				
###	28.11772	631	0.502288	53	-1	-	1 C)
#####				93.455				
###	73.08014	540	0.539861	96	-28	() 1	L
#####				69.992				
###	20.40493	501	0.486357	33	-7	-	1 0)
#####				76.347				
###	32.86464	146	0.408955	84	-13	-	1 1	<u> </u>
#####				68.064				
###	63.8987	332	0.771882	52	33	() ()
#####				90.514				
###	75.35162	404	0.012203	5	-28	-	1 0)

			81.373			
72.1569	625	0.598443	69	-6	1	1
			66.488			
37.94154	242	0.565508	22	1	1	1
			90.771			
76.97434	514	0.716179	26	29	1	1
			47.169			
38.97993	612	0.599029	99	-1	0	1
			41.013			
46.03198	472	0.826799	85	-43	0	0
			41.228			
79.71931	665	0.959075	01	34	1	0
			53.380			
71.97063	985	0.342524	62	-50	0	0
			46.708			
87.93787	358	0.227351	3	-43	1	1
			95.106			
72.60903	755	0.423597	32	-22	1	0
			37.408			
65.46469	570	0.28793	39	45	1	1
			78.929			
27.49398	111	0.61495	35	-46	1	0
			43.245			
49.41726	429	0.911852	51	35	1	1
			91.714			
41.21619	835	0.139116	6	-4	0	1
			97.292			
39.51917	883	0.100795	07	-17	1	0
			62.582			
97.84084	457	0.256016	9	14	0	1
51.44782	507	0.726096		4	0	1
			30.360			
91.36372	767	0.592963	16	39	1	0
70.49109	472	0.102213	28	_Q	1	1
				-0		
			46.003			
83.5849	107	0.918751	46.003 76	23	1	1
83.5849			46.003 76 93.609	23	1	
	107 221	0.918751 0.790085	46.003 76 93.609 09			1
83.5849 60.21097	221	0.790085	46.003 76 93.609 09 30.078	23 -21	1	1
83.5849			46.003 76 93.609 09 30.078 41	23	1	
83.5849 60.21097 66.15231	221 447	0.790085 0.023023	46.003 76 93.609 09 30.078 41 68.932	23 -21 31	1 1 1	1
83.5849 60.21097	221	0.790085	46.003 76 93.609 09 30.078 41 68.932 72	23 -21	1	1
83.5849 60.21097 66.15231 59.40142	221 447 775	0.790085 0.023023 0.651367	46.003 76 93.609 09 30.078 41 68.932 72 82.964	23 -21 31 -34	1 1 1 0	1 0 0
83.5849 60.21097 66.15231	221 447	0.790085 0.023023	46.003 76 93.609 09 30.078 41 68.932 72 82.964 51	23 -21 31	1 1 1	1
83.5849 60.21097 66.15231 59.40142 35.61944	221447775189	0.790085 0.023023 0.651367 0.771247	46.003 76 93.609 09 30.078 41 68.932 72 82.964 51 48.108	23 -21 31 -34 -25	1 1 1 0	1 0 0
83.5849 60.21097 66.15231 59.40142	221 447 775	0.790085 0.023023 0.651367	46.003 76 93.609 09 30.078 41 68.932 72 82.964 51 48.108 18	23 -21 31 -34	1 1 1 0	1 0 0
83.5849 60.21097 66.15231 59.40142 35.61944	221447775189	0.790085 0.023023 0.651367 0.771247	46.003 76 93.609 09 30.078 41 68.932 72 82.964 51 48.108	23 -21 31 -34 -25	1 1 1 0	1 0 0
	37.94154 76.97434 38.97993 46.03198 79.71931 71.97063 87.93787 72.60903 65.46469 27.49398 49.41726 41.21619 39.51917 97.84084 51.44782	37.9415424276.9743451438.9799361246.0319847279.7193166571.9706398587.9378735872.6090375565.4646957027.4939811149.4172642941.2161983539.5191788397.8408445751.4478250791.36372767	37.941542420.56550876.974345140.71617938.979936120.59902946.031984720.82679979.719316650.95907571.970639850.34252487.937873580.22735172.609037550.42359765.464695700.2879327.493981110.6149549.417264290.91185241.216198350.13911639.519178830.10079597.840844570.25601651.447825070.72609691.363727670.592963	72.1569 625 0.598443 69 66.488 37.94154 242 0.565508 22 90.771 26 47.169 38.97993 612 0.599029 99 41.013 46.03198 472 0.826799 85 41.228 79.71931 665 0.959075 01 53.380 71.97063 985 0.342524 62 46.708 87.93787 358 0.227351 3 95.106 72.60903 755 0.423597 32 37.408 65.46469 570 0.28793 39 78.929 27.49398 111 0.61495 35 43.245 49.41726 429 0.911852 51 91.714 41.21619 835 0.139116 6 97.292 39.51917 883 0.100795 07 62.582 97.84084 457 0.256016 9 51.44782 507 0.726096 91.535 30.360 91.36372 767 0.592963 16 </td <td>72.1569 625 0.598443 69 -6 66.488 37.94154 242 0.565508 22 1 90.771 76.97434 514 0.716179 26 29 47.169 47.169 38.97993 612 0.599029 99 -1 46.03198 472 0.826799 85 -43 41.228 -79.71931 665 0.959075 01 34 79.71931 665 0.959075 01 34 53.380 71.97063 985 0.342524 62 -50 46.708 46.708 46.708 46.708 47 47 87.93787 358 0.227351 3 -43 43 72.60903 755 0.423597 32 -22 37.408 45 48 65.46469 570 0.28793 39 45 45 49.929 24 44 49.41726 429 0.911852 51 35 44 41.21619 835 0.139116 6 -4 97.292 39.51917</td> <td>72.1569 625 0.598443 69 -6 1 66.488 37.94154 242 0.565508 22 1 1 76.97434 514 0.716179 26 29 1 47.169 47.169 47.169 38.97993 612 0.599029 99 -1 0 46.03198 472 0.826799 85 -43 0 0 46.03198 472 0.826799 85 -43 0 0 79.71931 665 0.959075 01 34 1 1 53.380 71.97063 985 0.342524 62 -50 0 0 0 46.708 87.93787 358 0.227351 3 -43 1 1 1 1 -62.708 -50 0 0 0 -62.708 -87.918 1 -72.60903 755 0.423597 32 -22 1 37.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.708 -62.582 <td< td=""></td<></td>	72.1569 625 0.598443 69 -6 66.488 37.94154 242 0.565508 22 1 90.771 76.97434 514 0.716179 26 29 47.169 47.169 38.97993 612 0.599029 99 -1 46.03198 472 0.826799 85 -43 41.228 -79.71931 665 0.959075 01 34 79.71931 665 0.959075 01 34 53.380 71.97063 985 0.342524 62 -50 46.708 46.708 46.708 46.708 47 47 87.93787 358 0.227351 3 -43 43 72.60903 755 0.423597 32 -22 37.408 45 48 65.46469 570 0.28793 39 45 45 49.929 24 44 49.41726 429 0.911852 51 35 44 41.21619 835 0.139116 6 -4 97.292 39.51917	72.1569 625 0.598443 69 -6 1 66.488 37.94154 242 0.565508 22 1 1 76.97434 514 0.716179 26 29 1 47.169 47.169 47.169 38.97993 612 0.599029 99 -1 0 46.03198 472 0.826799 85 -43 0 0 46.03198 472 0.826799 85 -43 0 0 79.71931 665 0.959075 01 34 1 1 53.380 71.97063 985 0.342524 62 -50 0 0 0 46.708 87.93787 358 0.227351 3 -43 1 1 1 1 -62.708 -50 0 0 0 -62.708 -87.918 1 -72.60903 755 0.423597 32 -22 1 37.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.408 -62.708 -62.582 <td< td=""></td<>

#####				35.886			
###	21.94528	415	0.077321	88	25	0	1
#####				52.850			
###	71.63778	277	0.104247	35	40	1	1
#####				69.189			
###	34.16885	639	0.84044	1	21	0	1
#####				38.109			
###	95.23669	831	0.910686	07	38	1	1
#####				56.368			
###	96.31429	968	0.122811	68	-5	0	0
#####				30.635			
###	93.18915	140	0.235906	07	17	0	1
#####				87.307			
###	49.6127	839	0.165521	56	-18	1	0
#####				38.991			
###	21.23653	803	0.186321	41	-50	0	0
#####				49.834			
###	94.26549	601	0.837491	01	-32	0	1
#####				31.289			
###	54.25473	244	0.332146	94	-20	0	1
#####				60.256			
###	97.33239	300	0.311444	85	29	0	0
#####				88.808			
###	97.0896	823	0.227396	51	-37	0	0
#####				57.450			
###	88.24076	560	0.607894	58	2	0	0
#####				42.564			
###	43.55591	831	0.379306	81	-3	1	1
#####				82.758			
###	50.80782	851	0.74425	92	18	1	0
#####				85.216			
###	88.09093	657	0.20558	49	39	0	1
#####				42.162			
###	45.35376	646	0.78779	74	11	1	1
#####				83.959			
###	33.55942	352	0.603722	79	41	1	1
#####				96.310			
###	64.5441	489	0.114267	85	15	1	0
#####				41.646			
###	94.89238	693	0.414505	43	13	0	1
#####				83.968			
###	75.68238	982	0.863518	9	19	1	1
#####				79.600			
###	65.60489	355	0.92296	04	12	0	1
#####				63.150			
###	27.77412	808	0.4657	17	22	1	1
#####				34.054			
###	69.20058	914	0.480837	43	-18	0	1
#####				35.228			
###	99.20431	549	0.918455	61	-10	0	0

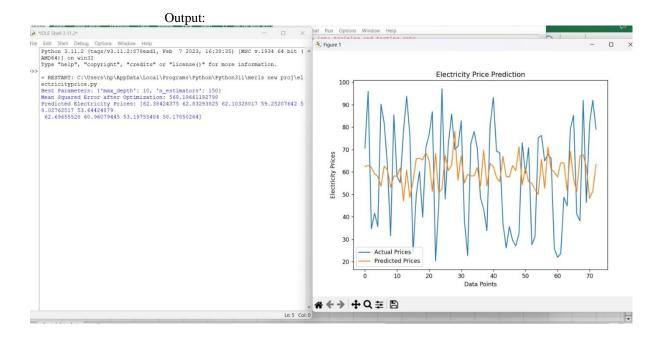
#####				89.669			
###	31.20672	109	0.587068	03	38	1	1
#####				99.310			
###	61.46637	923	0.032847	39	-3	1	1
#####				77.323			
###	90.18985	897	0.912749	66	-38	0	0
#####				61.217			
###	79.26149	341	0.248226	80	22	1	1
#####				75.330			
###	75.76126	350	0.577632		26	1	0
#####				71.607			
###	76.19873	976	0.165513		-20	1	1
#####				56.852		_	
###	48.75929	104	0.033879	86	24	0	0
#####		242		34.593	4-	_	•
###	43.48735	218	0.311473	83	17	0	0
#####	04 74000	000	0.700406	87.505	47	1	1
### #####	84.74889	900	0.780496		47	1	1
####	84.80907	473	0.277587	56.028 35	-47	1	1
#####	64.60907	4/3	0.277367	33	-47	1	1
###	89.36579	164	0.220097	Q7 215	-32	1	1
#####	85.30575	104	0.220037	47.675	-32	1	1
###	93.05924	245	0.212681	61	19	0	0
#####	33.03321	2.13	0.212001	30.072	15	Ü	Ū
###	60.90739	323	0.515174		47	0	0
#####				41.125			
###	60.1213	338	0.975541	68	31	1	0
#####				62.797			
###	83.86361	276	0.458989	76	-38	1	1
#####				96.101			
###	71.99711	878	0.557305	25	-28	1	0
#####				37.153			
###	76.15735	952	0.860632	55	32	1	0
#####				89.794			
###	83.66341	381	0.53507		24	1	1
#####	04 00040	4.60	0.404460	66.891			•
###	91.20043	162	0.184463	69	-50	1	0
#####	47.02061	21.0	0.200506	87.814	27	0	0
### #####	47.03961	316	0.299596	45 50.886	37	0	0
####	50.04664	953	0.309937	50.886 21	3	1	1
#####	30.04004	333	0.303337	88.796	3	1	1
###	27.51856	926	0.397318	3	20	0	0
#####	27.51050	320	0.00,010	84.097	20	J	J
###	66.26241	894	0.426789	59	38	1	1
#####				46.103		_	_
###	22.87538	788	0.799782	76	34	1	1
#####				39.193			
###	57.24784	560	0.349387	46	-36	0	1

#####				90.763			
###	63.41157	709	0.468232	8	14	0	1
#####				97.426			
###	42.9233	204	0.624976	57	25	0	1
#####				32.191			
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#####				81.188		-	
###	22.44002	610	0.836565		-36	1	0
#####	22111002	010	0.00000	93.666	33	-	J
###	22.98786	484	0.587454		-30	0	1
#####	22.30700		0.507 .5 .	90.015	33	Ü	_
###	85.80804	504	0.294045		-32	1	1
#####	03.00001	301	0.23 10 13	97.516	32	-	-
	48.81525	922	0.714059		9	0	0
#####	40.01323	322	0.714033	83.206	J	O	O
###	30.16484	617	0.527648		42	1	1
#####	30.10484	017	0.327048	60.960	42	1	1
###	61.77946	575	0.534456		38	1	1
#####	01.77540	373	0.554450	51.836	30	1	1
###	81.59948	808	0.481088		-18	1	1
#####	81.55548	808	0.401000	52.451	-10	1	1
###	37.26568	962	0.497012		-2	1	0
	37.20306	902	0.497012		-2	1	U
##### ###	60 02124	744	0.765356	80.709	45	1	0
#####	69.83124	744	0.705550	82.208	45	1	U
	26.8278	060	0.102981		-16	1	1
#####	20.0276	303	0.102961		-10	1	1
	24 12454	970	0.224262	44.025	-7	0	1
###	24.13454	870	0.334363		-/	0	1
#####	62 50027	F26	0.075503	90.768	20	1	0
###	62.50837	550	0.075503		39	1	0
#####	C2 25001	122	0.753346	80.044	40	0	0
	63.25081	122	0.753246		-40	0	0
#####	70.00420	664	0.272202	69.392	40	0	1
###	70.99439	664	0.272302	52	48	0	1
#####	70 00721	776	0.00743	63.007	24	1	1
###	78.08731	776	0.89743	27	21	1	1
#####	00 00017	013	0.526570	68.026	27	0	0
###	98.06817	813	0.526578	3	27	0	0
#####	C1 20402		0.00075	41.147	22	1	0
###	61.30403	557	0.80075	2	23	1	0
#####	4E 026E2	100	0.079021	44.259	1 -	0	0
###	45.83652	182	0.978931	09	15	0	U
#####	92 6140	244	0.020700	36.381	_	1	1
	83.6149	244	0.839789	51	-5	1	1
#####	44 00000	104	0.000004	40.756	42	0	0
###	41.66658	184	0.866994	06	-42	0	0
#####	FF 44774	477	0.407004	61.758	40	4	1
###	55.11771	177	0.407984		-48	1	1
#####	26 27654	FFC	0 551722	67.124	24	1	0
###	26.27651	556	0.551723	QΙ	34	1	0

22.02806 97.01187	977					
	977		31.250			
97.01187		0.253889	33	-25	1	0
97.01187			85.775			
	100	0.196113	85	21	1	0
			50.591			
86.87841	150	0.505508	76	-3	0	0
			93.828			
75.67794	784	0.595049	52	15	1	1
			97.725			
52.71624	816	0.339271	79	19	0	1
			42.982			
33.86355	871	0.569444	12	-23	0	0
			62.346			
32.51496	545	0.88746	81	42	0	1
			30.086			
40.01943	548	0.556722	23	-25	1	0
			71.882			
63.93813	980	0.720813	91	-26	0	0
			72.511			
77.16767	587	0.805315	45	-39	0	0
			47.327			
72.81579	899	0.988729	8	-46	0	0
			69.088			
42.39471	133	0.603197	89	47	1	1
			45.787			
96.38922	447	0.80685	81	-3	1	0
			41.257			
79.03175	194	0.962649	78	-14	0	0
			75.606			
64.34832	171	0.94441	36	28	1	1
			52.814			
68.93766	650	0.141082	70			
	030	0.1.1002		-7	1	0
	030		78 71.318	-7	1	0
53.568	253	0.406392	71.318 48	-7 49	1 0	0
	253	0.406392	71.318 48 60.327	49	0	0
53.568 39.81848			71.318 48 60.327 27			
	253 349	0.406392	71.318 48 60.327	49 -36	0 0	0
	253	0.406392	71.318 48 60.327 27 98.904 6	49	0	0
39.81848 48.47781	253 349 773	0.406392 0.32399 0.086925	71.318 48 60.327 27 98.904 6 40.470	49 -36 -8	0 0 1	0 0 1
39.81848	253 349	0.406392	71.318 48 60.327 27 98.904 6 40.470 64	49 -36	0 0	0
39.81848 48.47781 80.62769	253349773537	0.406392 0.32399 0.086925 0.633241	71.318 48 60.327 27 98.904 6 40.470 64 62.521	-36 -8 -3	0 0 1 0	0 0 1
39.81848 48.47781	253 349 773	0.406392 0.32399 0.086925	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9	49 -36 -8	0 0 1	0 0 1
39.81848 48.47781 80.62769 21.15148	253349773537217	0.406392 0.32399 0.086925 0.633241 0.735905	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631	49 -36 -8 -3 36	0 0 1 0	0 0 1 0
39.81848 48.47781 80.62769	253349773537	0.406392 0.32399 0.086925 0.633241	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631 96	-36 -8 -3	0 0 1 0	0 0 1
39.81848 48.47781 80.62769 21.15148 29.28581	253 349 773 537 217 870	0.406392 0.32399 0.086925 0.633241 0.735905 0.848128	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631 96 57.688	49 -36 -8 -3 36 19	0 0 1 0 1	0 0 1 0 1
39.81848 48.47781 80.62769 21.15148	253349773537217	0.406392 0.32399 0.086925 0.633241 0.735905	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631 96 57.688 16	49 -36 -8 -3 36	0 0 1 0	0 0 1 0
39.81848 48.47781 80.62769 21.15148 29.28581 23.68021	253 349 773 537 217 870 990	0.406392 0.32399 0.086925 0.633241 0.735905 0.848128 0.122777	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631 96 57.688 16 98.228	49 -36 -8 -3 36 19 -5	0 0 1 0 1 1	0 0 1 0 1 0
39.81848 48.47781 80.62769 21.15148 29.28581	253 349 773 537 217 870	0.406392 0.32399 0.086925 0.633241 0.735905 0.848128	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631 96 57.688 16 98.228 99	49 -36 -8 -3 36 19	0 0 1 0 1	0 0 1 0 1
39.81848 48.47781 80.62769 21.15148 29.28581 23.68021	253 349 773 537 217 870 990	0.406392 0.32399 0.086925 0.633241 0.735905 0.848128 0.122777	71.318 48 60.327 27 98.904 6 40.470 64 62.521 9 77.631 96 57.688 16 98.228	49 -36 -8 -3 36 19 -5	0 0 1 0 1 1	0 0 1 0 1 0
	33.86355 32.51496 40.01943 63.93813 77.16767 72.81579 42.39471 96.38922 79.03175 64.34832	33.86355 871 32.51496 545 40.01943 548 63.93813 980 77.16767 587 72.81579 899 42.39471 133 96.38922 447 79.03175 194 64.34832 171	33.86355 871 0.569444 32.51496 545 0.88746 40.01943 548 0.556722 63.93813 980 0.720813 77.16767 587 0.805315 72.81579 899 0.988729 42.39471 133 0.603197 96.38922 447 0.80685 79.03175 194 0.962649 64.34832 171 0.94441	52.71624 816 0.339271 79 42.982 33.86355 871 0.569444 12 62.346 32.51496 545 0.88746 81 30.086 40.01943 548 0.556722 23 71.882 63.93813 980 0.720813 91 72.511 77.16767 587 0.805315 45 47.327 72.81579 899 0.988729 8 69.088 42.39471 133 0.603197 89 96.38922 447 0.80685 81 41.257 79.03175 194 0.962649 78 75.606 64.34832 171 0.94441 36	52.71624 816 0.339271 79 19 42.982 33.86355 871 0.569444 12 -23 62.346 32.51496 545 0.88746 81 42 30.086 30.086 40.01943 548 0.556722 23 -25 71.882 71.882 -26 72.511 -26 72.511 -77.16767 587 0.805315 45 -39 47.327 -39 47.327 -46 69.088 -46 69.088 42.39471 133 0.603197 89 47 45.787 96.38922 447 0.80685 81 -3 -3 41.257 79.03175 194 0.962649 78 -14 75.606 64.34832 171 0.94441 36 28	52.71624 816 0.339271 79 19 0 42.982 33.86355 871 0.569444 12 -23 0 62.346 62.346 30.086 42 0 32.51496 545 0.88746 81 42 0 40.01943 548 0.556722 23 -25 1 71.882 63.93813 980 0.720813 91 -26 0 72.511 77.16767 587 0.805315 45 -39 0 47.327 47.327 -46 0 0 69.088 -46 0 0 42.39471 133 0.603197 89 47 1 45.787 -45.787 -46 0 0 96.38922 447 0.80685 81 -3 1 79.03175 194 0.962649 78 -14 0 64.34832 171 0.94441 36 28 1

#####				75.988			
###	76.29263	153	0.703946	87	-28	1	0
#####				82.994			
###	57.93391	335	0.910624	15	29	0	1
#####				96.685			
###	27.82673	488	0.624761		-4	0	1
#####				93.547			
###	59.32927	833	0.335866	31	-36	1	1
#####	00102027		0.00000	80.699		_	_
###	57.87774	862	0.825107		-26	1	1
#####	07.0777	332	0.020207	82.441		_	_
###	33.85615	924	0.363059		-15	1	1
#####	33.03013	32.	0.00000	40.214	23	-	-
###	54.70813	500	0.034228	55	24	0	0
#####	54.70015	300	0.054220	37.195	24	O	O
###	51.88038	723	0.830655	47	0	1	1
#####	31.00030	725	0.030033	69.963	O	_	-
###	69.26801	866	0.345192		-36	0	0
#####	03.20001	000	0.545152	31.285	30	O	O
###	70.80749	402	0.773835		17	1	0
#####	70.80743	402	0.773833	63.764	17	1	U
###	23.62432	306	0.362758	95	-30	1	0
#####	23.02432	300	0.302736	44.724	-30	1	U
###	40.06001	328	0.861068	44.724	-38	0	1
#####	49.96901	320	0.001000	54.221	-30	U	1
####	70.06879	952	0.219511		35	0	1
	70.06879	952	0.219511		33	U	1
#####	60.3500	677	0.074547	84.306	22	1	0
###	60.2509	677	0.974547		-32	1	0
#####	00 51010	174	0.770750	95.886	17	1	1
###	88.51919	174	0.779759	63	-17	1	1
#####	72 605 40	F2.4	0.44.4220	35.069	27	4	4
###	72.69549	534	0.114238	14	27	1	1
#####	22 22 475	202	0.555777	67.396	47	•	
###	33.03475	202	0.565777	95	17	0	1
#####	25.6455	F24	0.005267	91.777	4	0	4
	25.6455	521	0.985367		1	0	1
#####	74 20254	000	0.474065	35.775	2.4	0	0
###	71.39354	803	0.471065	6	-24	0	0
#####	22.4200	0.52	0.400407	87.715	22	•	•
###	22.1209	863	0.182107		-22	0	0
#####	66.06305	027	0.404770	55.046	22	0	4
###	66.86205	837	0.484778	09	-23	0	1
#####	05 24042	005	0.542450	52.546	4.6	0	0
###	95.21842	905	0.512458	63	-16	0	0
#####	66 00-00			98.422			
###	66.03793	405	0.741687	65	-43	1	1
#####	E4 05055		0.0000:-	44.060			
###	51.05359	197	0.698846	14	-35	1	1
#####	74 46006	0.40	0.400==	78.523	45	•	0
###	71.46306	949	0.40255	58	-15	0	0

#####				87.500			
###	56.66023	897	0.218023	85	-21	1	0
#####				32.882			
###	63.64934	434	0.645054	84	-33	1	0
#####				76.926			
###	95.31718	958	0.421704	98	-49	0	1



7. Conclusion

This analysis showcases the application of the RandomForestRegressor for predicting electricity prices. However, the direct adjustment by MSE might not be ideal for practical application and needs further exploration and refinement for accurate predictions.

This comprehensive report offers detailed steps for each stage of the analysis, including code segments for clarity. The Python code sections are designed to provide a deeper understanding and facilitate the reproducibility of the analysis.