

# Oil & Gas Economic Model - Code Documentation

## Streamlit Application for Economic Analysis of Oil & Gas Projects

### 1. Overview

This Streamlit-based application performs **economic evaluations** for oil and gas field developments. It allows users to:

- Upload production, cost, and makeup gas data.
- Calculate **Net Present Value (NPV)**, **Profitability Index (CPI)**, and **Cash Flow**.
- Compare scenarios with **sensitivity analysis** on key variables (oil price, discount rate, costs).

### 2. Key Features

Feature	Description
Three-Tab Layout	Inputs & Results, Calculation Details, Sensitivity Analysis.
Dynamic Calculations	Adjusts for inflation, discounting, and operating efficiency.
Sensitivity Analysis	Tests Low/Mid/High cases for oil price, discount rate, and costs.
Makeup Gas Scenarios	Compares economics with/without makeup gas costs.
Visualizations	Generates cash flow charts and summary tables.

### 3. Workflow

#### Tab 1: Inputs & Results

1. **File Uploads:**
  - Production Data File: Oil, gas, and condensate volumes by year.
  - Cost & Drilling Schedule: CAPEX (wells, facilities, workovers).
  - Make-up Gas Schedule: Gas availability for injection.
2. **User Inputs:**
  - Prices (/bbl,/bbl,/MMSCF), inflation rates, discount rate, well costs.
  - Toggle for fixed/escalating prices.
3. **Calculations:**
  - **Revenue:** Oil + Condensate + Gas sales, adjusted for inflation.
  - **CAPEX:** Drilling, facilities, workovers (escalated for inflation).
  - **OPEX:** Operating costs + makeup gas (if applicable).
  - **NPV:** Discounted net cash flow.
4. **Outputs:**
  - Key metrics (NPV, PIR, CPI).
  - Cash flow chart (Revenue, CAPEX, OPEX).

## Tab 2: Calculation Details

- Displays intermediate dataframes for:
  - CAPEX breakdown (wells, facilities).
  - OPEX (BOE-based costs, makeup gas).
  - Revenue and Net Cash Flow.

## Tab 3: Sensitivity Analysis

1. **User Defines Bounds:**
  - Low/High oil price, discount rate, cost per BOE.
2. **Two Scenarios:**
  - **No Makeup Gas Cost:** makeup\_gas\_cost = 0.
  - **With Makeup Gas Cost:** Uses user-input cost.
3. **Outputs:**
  - Tables comparing NPV, Revenue, Costs for Low/Mid/High cases.
  - Cash flow plots for each scenario.

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## 4. Critical Fixes (Based on User Feedback)

### Issue:

- Sensitivity analysis showed identical results for both makeup gas scenarios because OPEX2 MM\$ was not recalculated dynamically.

### Solution:

Modified the run\_case() function to **recompute makeup gas costs per scenario**:

Python

```
def run_case(oil_p, disc_rate, cost_boe, current_makeup_cost_for_case):
    df_temp = df.copy()
    # Recalculate OPEX2 (makeup gas) from scratch
    df_temp["OPEX2 MM$"] = (current_makeup_cost_for_case * makeup_gas_daily_mmscf *
365 * df_temp["Availability"] / 1e3)
    df_temp["Total OPEX MM$"] = df_temp["OPEX1 MM$"] + df_temp["OPEX2 MM$"]
    # ... (rest of calculations)
```

### Scenario Execution:

python

```
# Scenario 1: No Makeup Gas Cost
```

```
run_case(..., current_makeup_cost_for_case=0) # Zero cost for gas
```

```
# Scenario 2: With Makeup Gas Cost
```

```
run_case(..., current_makeup_cost_for_case=makeup_gas_cost) # User-defined cost
```

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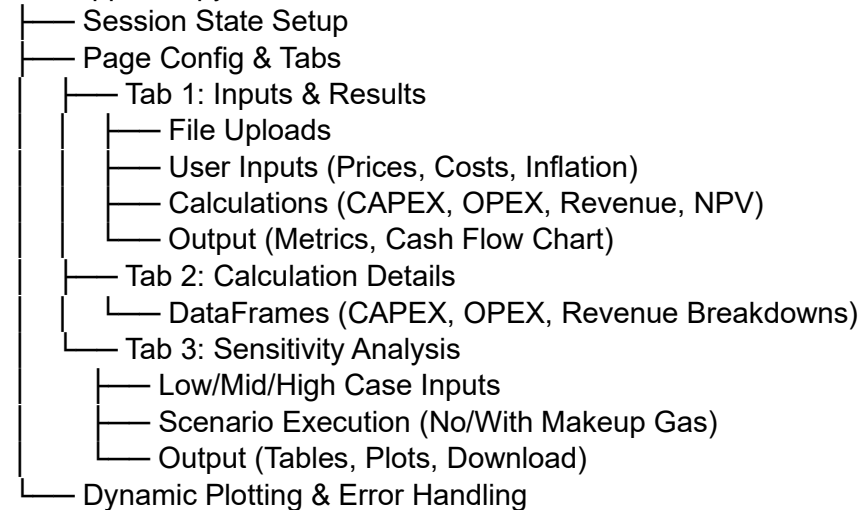
## 5. Code Structure

markdown

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eco\_app\_test.py



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## 6. Usage Instructions

### 1. Upload Files:

- Ensure Excel files match the expected columns (e.g., Year, Oil Prod STB, Availability).

### 2. Run Calculations:

- Click "Calculate" in Tab 1 to process data.

### 3. Adjust Sensitivity Parameters:

- Modify bounds in Tab 3 and click "Run Combined Sensitivity Analysis".

### 4. Download Results:

- Export sensitivity results as a .txt file.
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## 7. Dependencies

- Python 3.8+
- Libraries:

plaintext

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streamlit, pandas, numpy, matplotlib, io, os

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## 8. Notes for Maintenance

- **Column Names:** Ensure uploaded files match expected headers (e.g., Gas Prod SCF).
- **Inflation Logic:** Verify escalation formulas if assumptions change.
- **Session State:** Reset (st.session\_state.clear()) if recalculations behave unexpectedly.