**Python Game Operating Instructions and Overview**

**1. Introduction**

This document provides instructions on how to operate the Python game, a simulation of resource management involving power generation methods. The game challenges players to manage water and carbon emissions while making decisions about different power generation methods.

**2. Operating Instructions**

**2.1 Installation**

1. **Download**: Obtain the executable file  (main.exe) from the provided source.
2. **Run the Game**: Double-click the main.exe file to start the game.

**2.2 Controls and Gameplay**

1. **Main Menu**:
   * **Start Game**: Begin a new game session.
   * **Load Game**: Continue from a previously saved state (if applicable).
   * **Settings**: Adjust game parameters (e.g., difficulty, sound).
   * **Exit**: Close the game.
2. **In-Game Controls**:
   * **Number Keys (1-7)**: Select a power generation method from the menu.

A computer screen with text

Description automatically generated

Key 1: Coal Power

Efficiency: ~33%

Carbon Emissions: ~820 g CO2/kWh

Water Needed: High

Description: Coal power plants have relatively low efficiency and high carbon emissions. They require significant water resources and produce a large amount of CO2.

Key 2: Natural Gas Power

Efficiency: ~45-60%

Carbon Emissions: ~490 g CO2/kWh

Water Needed: Moderate

Description: Natural gas power plants are more efficient than coal but still produce considerable carbon emissions. They require a moderate amount of water.

Key 3: Nuclear Power

Efficiency: ~33-37%

Carbon Emissions: ~15 g CO2/kWh

Water Needed: Low

Description: Nuclear power plants have low carbon emissions but require substantial amounts of water for cooling. They are less efficient compared to some renewable sources.

Key 4: Solar Power

Efficiency: ~15-20%

Carbon Emissions: ~20-50 g CO2/kWh (including manufacturing)

Water Needed: Very Low

Description: Solar power is a renewable source with relatively low carbon emissions and minimal water requirements. However, its efficiency is lower compared to other methods.

Key 5: Wind Power

Efficiency: ~30-45%

Carbon Emissions: ~11 g CO2/kWh

Water Needed: Very Low

Description: Wind power is a highly efficient and renewable energy source with very low carbon emissions and minimal water needs.

Key 6: Hydropower

Efficiency: ~90%

Carbon Emissions: ~4 g CO2/kWh

Water Needed: High (depends on the scale of the dam)

Description: Hydropower has the highest efficiency and very low carbon emissions. It requires a significant amount of water, especially for large-scale dams.

Key 7: No Power Generation

Efficiency: 0% (No power generation)

Carbon Emissions: -20 g CO2/kWh (Negative, as plants absorb CO2)

Water Needed: None

Description: This option represents a scenario where no power is generated. It results in a reduction of carbon emissions due to the absorption of CO2 by plants. There are no water requirements, but the game continues without power generation, affecting resource management and survival.

* + **Enter**: Confirm your choice of power generation method.
  + **Esc**: Pause the game or return to the main menu.

**2.3 Gameplay Instructions**

1. **Choosing a Power Generation Method**:
   * The game presents a list of power generation methods such as Coal, Natural Gas, Nuclear, Solar, Wind, and Hydro.
   * Each method has associated data including water needed and carbon emissions.
   * Select a method by entering the corresponding number.
2. **Managing Resources**:
   * **Water Supply**: Monitor the available water and ensure it meets the daily needs of the population.
   * **Carbon Emissions**: Track the total carbon emissions and compare them against the emission limit.
3. **Making Decisions**:
   * Your choice of power generation method affects both water supply and carbon emissions.
   * Make strategic decisions to balance resource management and avoid reaching critical limits.
4. **Monitoring Outcomes**:
   * The game provides real-time updates on water supply, population, and carbon emissions.
   * Visual aids such as graphs are updated every 10 days to reflect changes in the game.

A graph of a graph

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**3. Summary of How It Works**

**3.1 Game Mechanics**

* **Resource Management**:
  + Players must balance the water supply and carbon emissions based on the chosen power generation method.
  + Each method affects resources differently. For example, Coal requires more water and produces higher carbon emissions compared to Wind or Solar energy.
* **Simulation Engine**:
  + The game uses a Python script to simulate resource changes over time.
  + matplotlib is used for plotting graphs of resource levels and emissions.
* **Game Progression**:
  + The game advances daily, with resource levels and emissions updated accordingly.
  + Players must manage resources effectively to ensure survival and avoid reaching critical thresholds.

**3.2 Data Used**

* **Efficiency and Emissions Data**:
  + The game includes efficiency rates and carbon emissions for various power generation methods based on real-world data.
  + Examples: Coal (33% efficiency, 820 g CO2/kWh), Wind (38% efficiency, 11 g CO2/kWh).

**4. Losing Conditions**

You will lose the game under the following conditions:

1. **Water Shortage**:
   * If the available water supply is insufficient to meet the daily needs of the population, the population will decrease due to water shortages.
   * If water supply is critically low and cannot support the population, the game ends.
2. **Exceeding Carbon Emission Limit**:
   * If total carbon emissions exceed the specified limit (10,000 grams), the game ends with the message that the island has been submerged due to high carbon emissions.
3. **Population Depletion**:
   * If the population reaches zero due to resource mismanagement or high carbon emissions, the game ends with a notification of game over.

**5. Conclusion**

The Python game offers an engaging simulation of power generation and resource management. Players need to make strategic decisions to manage water supply and carbon emissions while adapting to changing conditions. By understanding the game mechanics and carefully choosing power generation methods, players can aim to achieve sustainability and avoid losing conditions.

**6. References[[1]](#footnote-1)**

1. **Coal Power:**

   *Efficiency:* 33% [Source: U.S. Energy Information Administration (EIA), "Coal Explained," 2022]

   *Carbon Emissions:* 820 g CO2/kWh [Source: International Energy Agency (IEA), "Coal," 2022]

   **Natural Gas Power:**

   *Efficiency:* 45-60% [Source: U.S. Energy Information Administration (EIA), "Natural Gas Explained," 2022]

   *Carbon Emissions:* 490 g CO2/kWh [Source: International Energy Agency (IEA), "Natural Gas," 2022]

   **Nuclear Power:**

   *Efficiency:* 33-37% [Source: World Nuclear Association (WNA), "Nuclear Power Economics," 2022]

   *Carbon Emissions:* 15 g CO2/kWh [Source: World Nuclear Association (WNA), "Nuclear Power and the Environment," 2022]

   **Solar Power:**

   *Efficiency:* 15-20% [Source: National Renewable Energy Laboratory (NREL), "Photovoltaic Efficiency," 2022]

   *Carbon Emissions:* 20-50 g CO2/kWh [Source: International Energy Agency (IEA), "Renewable Energy," 2022]

   **Wind Power:**

   *Efficiency:* 30-45% [Source: American Wind Energy Association (AWEA), "Wind Energy Basics," 2022]

   *Carbon Emissions:* 11 g CO2/kWh [Source: International Energy Agency (IEA), "Wind Energy," 2022]

   **Hydropower:**

   *Efficiency:* 90% [Source: U.S. Department of Energy (DOE), "Hydropower Basics," 2022]

   *Carbon Emissions:* 4 g CO2/kWh [Source: International Energy Agency (IEA), "Hydropower," 2022]

   **No Power Generation:**

   *Carbon Emissions:* -20 g CO2/kWh (Negative, as plants absorb CO2) [Source: Various sources on natural carbon sequestration, e.g., NASA Earth Science, 2022]

   **Additional Resources:**

   *Comparative Efficiency and Carbon Emissions of Power Generation Methods* [Source: "Global Energy Review," International Energy Agency (IEA), 2023]

   *The Efficiency of Different Power Generation Methods and Their Impact on Climate Change* [Source: "Energy and Climate Change," Environmental Science & Technology, 2022] [↑](#footnote-ref-1)