

A large, dark funnel is positioned at the top of the frame, pouring a steady stream of colorful dice into a large, cylindrical container below. The dice are in various colors (yellow, cyan, red, purple, orange, white) and feature different numbers and symbols on their faces. The background is a stylized industrial setting with silhouettes of buildings and pipes against a warm, orange-hued sky. The word "REFINED" is written in large, bold, black letters with a white outline, centered across the middle of the image.

REFINED

REFINED® 2025 - RULEBOOK REVISION 9.5 (July 7, 2025)

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REFINED - THE CRUDE OIL BOARD GAME

REFINED has been a thought and idea I have continued to develop in my mind since I started working in oil and chemical industry over 30 years ago. Working in this industry always fascinated me, how a simple barrel of crude oil can be turned into so many everyday items, including the rules book you are now reading; the carbon black and pigments in the inks, the polymers to make the paper durable and accept the ink.

REFINED represents a simplified model of a highly complex and extremely dangerous process of tuning a smelly, sticky black liquor into the various chemical components and products that service the world's consumers. From filling your car's gas tank to fueling the large jumbo jets that ferry hundreds of passengers from one side of the globe to the other, the products of crude oil move and surround us. Over 102 million barrels (approx. 4.2 billion gallons or 16.2 billion liters) of crude oil are consumed every day. (U.S. Energy Information Administration (EIA) 2023#). Who could imagine today's mind-boggling demand for a smelly, flammable, sticky, thick liquid would be the key energy and raw material source for billions of products used and consumed around the world?

Since the beginning, oil processing has been a mixture of oil extraction combined with the alchemy developed at the turn of the seventh century. If it was not for an Arabic scholar and inventor Jabir ibn Hayyan (aka Geber) who invented the basic distillation process back in approximately 800 A.D., the products produced today from crude oil may never have existed. Jabir's scholarly efforts built the basic understanding that lighter molecules could be separated from heavier molecules by controlled heating. This basic distillation process can also be used to produce several alcoholic beverages and libations which could be argued were more important than oil-derived products, but I digress.

Seeping oil close to the surface of the earth (e.g., tar pits) has long been used as a crude heating and light source with even some make-shift weapons being crafted with this sticky material. However, once the first commercial oil wells were drilled in a Pennsylvania field in 1878, the world of oil products (commonly called distillates) have continued to expand both downstream products and refining technology.

The first commercial products of modern crude oil were simple distilling/stripping of the light paraffins and kerosene streams to make a clean-burning fuel to replace whale oil which was in tight supply. Creating and exploiting this new energy and raw material resource has become the largest global industry that powers and fuels every other industry and technology.

The first oil "refineries" did not use a significant percentage of the oil components in the barrel. The main products in the beginning of oil refinery were the middle fraction of kerosene and fuel oils which powered the industrial revolution at the end of the 19th Century. In the beginning, the exceptionally light products, which consisted of often volatile and odorous gases of the crude oil process, were potentially extremely dangerous and many explosions and fires resulted because refineries did not have the necessary processes nor equipment to safely contain and process these compounds. The heavy "bottom" products from the early crude oil distillation processes were simply used to coat roofs and inexpensive water-proofing or rudimentary pavement systems and dust control. As the years passed and the oil industrial revolution expanded, new combustion engines powered the railroads and ever larger ships of the early 20th century. These new diesel engines required heavy and non-volatile fuel (diesel/fuel oils) which were safer and easier to handle as liquid which could be pumped. These new diesel fuels quickly replaced the labor-intensive and dirty coal-fired systems previously utilized by the railroads and industry. However, not until the introduction of the

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gasoline engine did the expansion of oil refining technology expand and how to maximize every carbon molecule in the barrel of crude. This innovation and research have led to continuous product and equipment development for the past two centuries.

Crude oil is a little like “a box of chocolates,” you never know what you may get regarding the specific components in the barrel. A crude oil barrel is a mixture of various hydrocarbon fractions ranging from small and volatile compounds (e.g., methane, ethane, ethylene, butane, etc.) to large polymeric and unruly fractions like asphaltenes with carbon values much greater than C_{70+} . The oil industry developed a method to characterize these various fractions called API degree (American Petroleum Index). API represents the average boiling point (e.g., molecular weight) of the mixed carbon fractions in the oil barrel. Lighter hydrocarbon components with a lower boiling point (<100 C) will have a higher API value vs. a large complex tar like material. Typical API values range from 10° - 50°. The location of the crude oil reverse has everything to do with the API value. The heavy and thick Canadian sand tar oil may have low API Values (18-25°), while the “lighter” West Texas (WTI) crude streams will have API values greater than 33-38°. The modern oil industry has developed technologies designed to process any of these API grades. However, most refineries are specifically designed and operated to process and maximize the fraction extraction of a specific type of crude oil supply.

Oil processing provides so many products and consumables to global citizens. As previously stated, oil refining industry powers and moves the world. REFINED tries to mimic the various markets and products produced and supplied by the oil refining process which is currently breaking down globally in the following manner:

- **AUTOMOTIVE GASOLINE (aka PETROL): 40-45%**
- **DIESEL FUEL and FUEL OILS (Trucks, Rail and Large vessel): 20-25%**
- **AVIATION KEROSENE/FUEL: 8-12%**
- **CHEMICALS and PLASTICS, METAL REFINING, SOAPS, WAXES, SYNTHETIC FABRICS, LUBRICANTS, SOLVENTS, RUBBER and ASPHALT: Make up the remaining percentage, typically around 25-35%.**

Therefore, 60-70% of the oil refining capacity is used for transportation and basic energy with the remainder refined distillation products being utilized to produce the consumer goods we use every day.

Oil processing is a challenging and lucrative industry representing over \$3.5 Trillion dollars in annual revenue which eclipses every other industry sector (ref. www.iea.org reports). Being a foundational economic industry, the production and refining of oil products directly affects every other industry in some form or fashion.

REFINED, the game is a crude attempt to make a fun and entertaining game out of this complex and world-defining industry. REFINED uses six different colored dice and specific carbon values on the die faces to represent the various oil components and carbon values. The colors of dice represent the different component boiling points (i.e., molecular weight of the carbon). Table 1 on the next page explains the potential types of hydrocarbons the specific dice colors and dice faces represent in an oil barrel. This chart is in no way an exhaustive list of components for each size of carbon numbers, but it may give you additional flavor and background for playing the game. I hope you find the game REFINED as interesting and intriguing as the rich and exciting history of the oil & gas processing industry.

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Table 1: POTENTIAL HYDROCARBONS REPRESENTATION OF DICE VALUES

CARBON 1	Simplest hydrocarbon-basic building block of chemical products. Methane, methanol, formaldehyde, formic acid, carbon monoxide and dioxide gases. Uses - Major component of LNG	CARBON 12/14	Clean burning high octane compounds. Premium kerosene grades. Linear paraffins and isoparaffins. Uses - Aviation fuels, Jet A
CARBON 2/3	Compounds like ethylene, propylene, ethane, propane, acrylic monomer, vinyl monomer, acetic acid, acrylic acid, ethylene oxide, propylene oxide, and isopropyl alcohol. Uses-Chemical building blocks for plastics, soaps and pharmaceuticals.	CARBON 16/20	Branched paraffins and unsaturated hydrocarbons. High cetane content. Used as primary diesel fuel, kerosene, light fuel oils components. Liquids at room temperature.
CARBON 4/5	Butane, Pentane, Pi-gases, amyl, butadiene, DCPD, vinylacetylene, cyclo C ₄₋₆ species. Uses-Key chemical intermediates and monomers, synthetic rubber, lighter fluid, low octane gasoline blends, gas detergent.	CARBON 20/28	Low volatility branched paraffins and unsaturated hydrocarbons. Uses- Heavy diesel fuel blends, marine fuel oils and chemical cracking feedstock. Products may be thick or solids at lower temperature.
CARBON 4/5	Lighter fluid, low octane gasoline. butane, isobutane, isobutylene, raffinates, pentene, pi-gas, amyl, butadiene, cyclopentane. Uses - Monomer to produce adhesives, tapes and fuel detergents.	CARBON 16/20	Heavy fuel oils and linear waxes. Highly saturated oil paraffins and waxes. Semi solids at room temperature. Uses - petroleum jelly and reforming feedstock.
CARBON 6/9	Hexane, Hexene, Heptane, IsoHexane, IsoOctane, n-Octane. Standard octane gasoline components. Uses- Low boiling solvents and primary distillates for mid-octane gasoline.	CARBON 22/36	Larger hydrocarbons and paraffins with highly branched structures. Uses - candles, industrial waxes, lubricants and greases. Reforming feedstock.
CARBON 8/12	Neodecane, Dodecane, Isooctane species. Uses- High octane blending components for gasoline.	CARBON 30/50	High viscosity paraffins and complex hydrocarbons structures. poly alkenes and alkanes. Uses -high temperature industrial waxes and hydraulic fluid base stocks.
CARBON 6/9	Aromatics compounds (toluene, cumene, benzene, xylene), phenol and naphthalene compounds. Aromatic 100/150. Gasoline blends. Excellent solvents and chemical feedstocks.	CARBON 30/50	High viscosity paraffins and complex hydrocarbons structures. Poly alkenes and alkanes. Uses - high temperature industrial waxes and fluids. Foundry/ metal and crude marine fuel source "Mazut"
CARBON 10/12	Primary naphthalene cut, cycloaliphatics, VM&P, mineral spirits, light paraffins, Stoddard Solvents. Mono and di cycloparaffins. Uses- Chemical feedstock for cracking into lighter molecules.	CARBON 50/70	Extremely viscous compounds at high temperatures. Large complex carbon structures - asphaltene and similar components. Uses - road construction, roofing materials and waterproofing products.
CARBON 11/15	Heavy naphtha components-multi-ring cycloaliphatics, dimer structures, mineral oils, synthetic fatty acids. Uses - Chemical feedstock for cracking into lighter molecules.	CARBON 70+	Unprocessable fractions of crude oil production, similar properties to coal. Use- petroleum coke used by steel mills, metal and aluminum foundries as cheap carbon source for furnaces.

COMPONENT LIST

MAIN BOARD

45 - CRUDE API OIL CARDS/TICKETS
 48 - PRODUCTS CONTRACTS
 (8 Starting "S" & 40 Regular)
 32 REFINERY ACHIEVEMENT CARDS
 (2 STARTING ACHIEVEMENTS
 "Best Refinery Technology" and
 "Reprocessing Expert" CARDS)
 CUSTOM DICE (6 COLORS – BEIGE,
 YELLOW, ORANGE, RED, AQUA AND
 MAGENTA)- 24 DICE OF EACH COLOR
 COMMODITY PRICE TRACKERS (6)

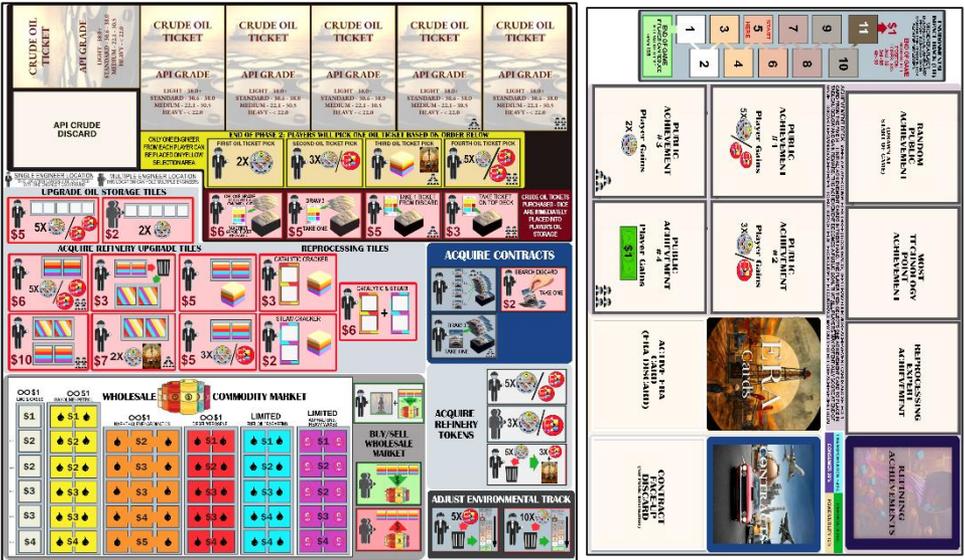
60 REFINING TOKENS (GREY)
 40 BYPASS TOKENS (RED)

SPECIFIC PLAYER COMPONENTS (X4)

PLAYER REFINERY BOARD
 5 ENGINEER MEEPLES (WORKERS)
 20 COLORED PLAYER MARKERS
 REFINERY UPGRADE TILES
 - 7 Basic (Solid Colored)
 - 5 Advanced (Striped)
 - 3 Oil Storage Tiles
 - 4 Reprocessing Upgrades

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- Place the two **MAIN BOARDS** (MAIN BOARD) in the middle of the players' boards so that all players can reach the various **ENGINEERING** locations and cards. These two boards can be positioned separately to fit table and players.



- CREATE ERA DECK** – The ERA deck serves a round timer for the game and the number of cards in the ERA DECK is based on the number of players:

Number of Players	Number of Total ERA Cards (Rounds)	Recommendation ERA Cards in Deck
3-4	5	Bottom (ERA IV x 2, ERA III x 1, ERA II x 1, ERA I x 1) Top
2	6	Bottom (ERA IV x 1, ERA III x 1, ERA II x 2, ERA I x 2) Top

Example - 4 Player ERA DECK - Shuffle the all the ERA IV cards and select two cards and form the bottom card of the ERA deck, repeat the process with ERA III cards and place the one ERA III cards on top of the two ERA IV card(s), repeat selection process with ERA II cards and place these cards on the previous ERA cards and finally shuffle and select one ERA I cards and place on top of EVENT DECK. Place this newly created deck (do not shuffle) on the **ERA DECK** location on the **MAIN BOARD**.

LONGER GAME: If you want to play a longer game, you can add an additional 1 or 2 ERA cards to the ERA deck, just keep the specific ERA cards in order when built.

- Separate the six different colored dice (beige, yellow, orange, red, aqua, and magenta) and place them near the board and players as the crude oil supply.

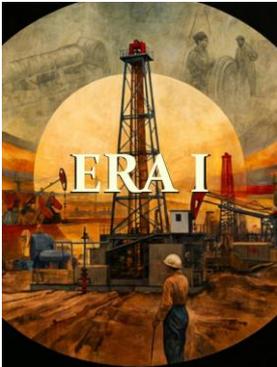
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5. Shuffle the API Crude Oil Tickets with the color squares face down. Deal **CRUDE OIL TICKETS** equal to the number of players +1 face down to the CRUDE OIL MARKET AREA (**OIL TICKET color cubes should not be visible**).
6. Players take 1 of their colored player markers and place it on “5” on the ENVIRONMENTAL IMPACT TRACK (“EIT”).
7. Players place all their equipment upgrades and refinery expansion pieces near their player board.
BASIC UPGRADES/REPROCESSING – Basic-solid colored distillation upgrades (purple, blue, red, orange and 3 beige) and Reprocessing upgrades (2) and 3 oil storage expansion tiles.
ADVANCE UPGRADES (5) – Diagonal striped upgrades with two colors that will upgrade the column locations between the two specific color in the column.
8. Players start with three (3) ENGINEERS available on their Player Board. Players can gain additional engineers by completing contracts – see Player Board p 22.
9. Give each player a PLAYER AID/PHASE SUMMARY for reference.
10. Place the two types of REFINERY TOKENS (BASIC REFINING (GRAY) TOKEN and BYPASS (RED) TOKENS) near the MAIN BOARDS. Each player starts with two basic REFINING TOKENS and 1 BYPASS TOKEN (TOKEN EFFECTS p 24.)
11. In the ACHIEVEMENT CARDS, find the **Best Refinery Technology** and **Reprocessing Expert** ACHIEVEMENT cards, and place them on the MAIN BOARD.
12. Shuffle the rest of the REFINERY ACHIEVEMENT Deck and deal two cards to card player. Each player will select one of these Achievement cards to start the game. Players may want to review both starting contracts and Achievement Cards together to make their decision.
13. Shuffle the eight starting CONTRACTS (with “S” in lower left corner) and deal 2 to each player. Each player selects one of the starting contracts and returns the other to the CONTRACT discard pile. This choice may be made in combination with Achievement cards.
14. Shuffle the remaining CONTRACT and REFINING ACHIEVEMENT cards place them on the MAIN BOARD. Place discarded Achievement Card on bottom of deck.
15. The player who most recently purchased gas for their car, plane or boat will be the First player. Give them the 1st Player token – game play will continue clockwise from the first player.
16. Set up the Bank using the money tokens. The First player receives with \$10 from the bank and each player after the first player takes an additional \$1 (i.e., the 3rd player \$12, 4th player \$13).
17. You are ready to start REFINED! Start ERA Phase by revealing first ERA card!

ROUND SUMMARY (6 PHASES)

- A. **ERA PHASE** - REVEAL NEW ERA CARD, READ CARD, AND UPDATE WHOLESAL MARKET PRICES. RESOLVE ENVIRONMENTAL OPPORTUNITIES OR PENALTIES.
- B. **ENGINEERING PHASE** – PLAYERS WILL PLACE THEIR ENGINEER ON THE MAIN BOARD TO GAIN OIL TICKETS, CONTRACTS, REFINERY TOKENS, PURCHASE UPGRADES AND INCREASE CAPACITIES ON THEIR REFINERY PLAYER BOARD.
- C. **REFINING PHASE (LOADING COLUMN)** - ROLLING DICE and SPEND REFINERY TOKENS TO MANIPULATE DICE RESULTS SO ALL THE DICE CAN BE PLACED INTO THE SPECIFIC AREAS OF THE DISTILLATION COLUMN OR REFINERY EQUIPMENT.
- D. **SELLING PHASE** - PLAYERS SELL THEIR NEWLY DISTILLED PRODUCTS (COMMODITIES) TO THE WHOLESAL MARKET AND/OR TO FULFILL CONTRACTS
- E. **REPROCESSING PHASE** - PLAYERS PAY TO REPROCESS DICE LOCATED IN REPROCESSING EQUIPMENT. THE DICE ARE CONVERTED INTO DIFFERENT DICE POTENTIALLY CREATING MORE DICE IN THE PROCESS. THESE RECYCLED DICE ARE EITHER RETURNED TO THE PLAYER’S OIL STORAGE AREA OR CONVERTED “FLARED” TO CREATE ADDITIONAL REFINERY TOKENS FOR FUTURE ROUNDS.
- F. **REFRESH PHASE/END OF GAME CHECK** - RETURN ENGINEERS FROM THE MAIN BOARD, DISCARD UNCLAIMED CRUDE OIL TICKETS & CHECK FOR THE END OF GAME (NO MORE ERA CARDS REMAINING), PASS 1ST PLAYER.

A. EVENT PHASE - REVEAL THE TOP CARD AND APPLY EFFECTS



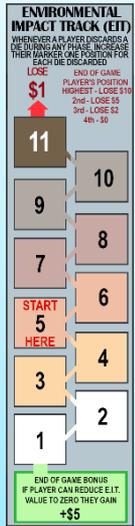
The historical **ERA DECK** will function as the primary game timer based on the number of players. When revealed at the start of the round, the ERA DECK will potentially have 3 actions. First, it will update the WHOLESAL MARKET commodity prices. Second, the ERA card may also have new potential demand locations for players to sell dice for that ROUND. The ERA card may also have an ENVIRONMENT TRACK condition to resolve or fulfill. This condition may penalize players based on their current position on the ENVIRONMENTAL TRACK.

STRATEGY NOTE: Not every ERA card is positive and may have negative impacts on player’s future operations. Therefore, knowing the future events can be advantageous for planning your operations.

ENVIRONMENTAL IMPACT TRACK (“EIT”)

This track is used throughout REFINED to determine the “most environmentally friendly” refinery operator at the end of the game. Whenever a player loses a die due to lack of refining capacity or oil storage during operations, they must move their player marker up track one spot per die lost. Players will begin the game at “5” on the EIT and can either improve their environmental image or pay a price at the end of the game. If a player reaches the “10” and must increase EIT value, they instead lose \$1. At the end of the game, the player that has the highest environmental impact (most negative image) loses \$10, 2nd loses \$5, 3rd loses \$3, 4th loses \$0. Ties are added and split and round up. In 3-player games do not award at 3rd place (\$10, \$5,0) and 2-player game award only 1st position (LOSE \$10).

FRIEND OF THE ENVIRONMENT BONUS - If a player has successfully navigated the operational and historical challenges and moved their player markers to the bottom of the EIT track, they will receive a \$5 bonus at the end of the game - this bonus is rewarded at all counts.



B. ENGINEER PHASE – GAIN RESOURCES AND UPGRADE REFINERY

Players will have multiple areas on the **MAIN BOARD** to place their **ENGINEERS** to gain resources (crude oil, REFINERY tokens) and improve their refinery capabilities (upgrades). This Phase is complete once all players’ **ENGINEERS** are placed on the MAIN BOARD. There are three types of **ENGINEER** placement locations that players can use on the MAIN BOARD.

SINGLE ENGINEER LOCATIONS (BLACK FIGURE w/WHITE TIE) - Only one player’s **ENGINEER** can be placed on these single-use locations each round. A player must have all the necessary funds to pay for the action if required. These locations are typically color coded, either **GREEN** (Player may potentially gain money) or **RED** (Player will have to pay money).



GOLD/YELLOW ENGINEERING LOCATIONS (SINGLE USE)– These are single **ENGINEER** locations; however, with one special condition – **EACH** player may place only one **ENGINEER** on a **YELLOW** location each round.

MULTIWORKER ENGINEER (GREY/WHITE/BLACK FIGURE) - These **ENGINEERING** location’s benefits or resources are immediately gained when a player’s **ENGINEER** is placed on them. There is **NO** limit to the number of players’ **ENGINEERS** that can be placed at these locations. If the location is an equipment upgrade, the player must pay any



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required equipment costs printed on the MAIN BOARD and any additional costs on their PLAYER BOARD (e.g., OIL STORAGE upgrades.)

SPECIFIC ENGINEERING ACTION LOCATIONS

ACQUIRE ADDITIONAL CONTRACTS – There are three ways to acquire additional contracts in the game. The primary method is drawing contracts equal to player count +1 and drafting these contracts around the table. A player may also pay \$2 to search for the discard pile (contracts in the discard may not be searched) and select one contract from the contract discard pile. In a 3+ player game, a player can select three contracts from the top of the deck and choose one.

The contracts represent everyday products or articles that every person would recognize in their daily lives- Tires, Soap, Airline Fuel, Paints, Gasoline, Brake & Engine Oils, Polymers, Pharmaceuticals etc. The contracts are the primary source of income (VP) during the game and are typically more lucrative than selling to the WHOLESALE MARKET, but sometime players need to sell their excess dice when they do not have enough contracts to fulfill.

CRUDE OIL TICKET DRAFT (“GOLD” LOCATIONS) – A player may only place one ENGINEER on a Gold/Yellow location each round. This allows each player the



opportunity to gain one “free” crude oil ticket from the market each round-however, the specific position selected determines draft order for the tickets. Players will select one of the “yellow” locations below the face-down CRUDE OIL TICKETS for the round. This position sets the draft order

at the end of ENGINEERING phase. When a player places their ENGINEER on a specific Yellow/Gold location, the player will turn over one of the TICKETS available for the round and reveals its specific dice distribution. At the end of

Table 2: Oil Component Distribution by API Type

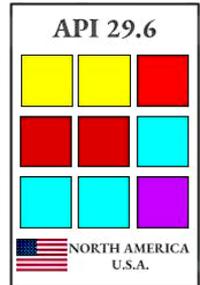
Oil Grade /Component	Light (~24%) API 38.0 +	Standard (~40%) API 37.9 - 30.5	Medium (~20%) API 30.4 - 22.5	Heavy (~15%) API < 22.4
Beige/Pink	◆◆◆◆◆	◆		
Yellow	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	◆
Orange	◆◆◆	◆◆◆◆◆	◆◆	◆◆◆◆◆
Red	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆
Blue	◆◆	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆
Magenta		◆	◆◆◆	◆◆◆◆◆

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the ENGINEERING PHASE, the players in selected order will choose any available TICKET displayed in API OIL market.

Players will have some idea of the potential dice distribution of the CRUDE OIL TICKETS based on the API GRADE listed on the back of the tickets. There are four different grades of oil in the game. HEAVY, MEDIUM, STANDARD or LIGHT (see Table 2).

These oil grades are generated based on the AVERAGE API (American Petroleum Institute) gravity value of the various hydrocarbon components. The higher the API gravity number the “lighter” the component fractions so more BIEGE, YELLOW and ORANGE dice will be shown on the CRUDE OIL TICKET. Once a TICKET is selected, the player gains the specific color dice from the supply. All the dice gained must be placed in their OIL STORAGE AREA. If any dice acquired during the ENGINEERING phase does not fit into players’ oil storage area due to lack of storage positions, the player must discard any extra dice and immediately move their player marker up the ENVIRONMENTAL IMPACT TRACK (EIT) for each dice discarded.



STRATEGY NOTE: Make sure to have developed enough oil storage for all your dice to store and enough distillation upgrades (i.e., refinery capacity) to manage and fulfill your contracts.

ADDITIONAL ENGINEER LOCATIONS (Page 17) - Purchasing upgrades for refinery to expand capacity, acquiring 1st player, gaining additional REFINERY TOKENS, purchasing CRUDE OIL TICKETS, gaining additional contracts.

C. REFINING PHASE – LOAD DISTILLATION COLUMN (DK BLUE LINES)

ROLLING AND MANIPULATION CRUDE OIL DICE

After the players have acquired all their new crude “unrefined” dice during the end of ENGINEER phase and the new dice have been placed into their OIL STORAGE AREA with any previous recycled dice from previous rounds. Players will start the game with no dice in their OIL STORAGE area.

Players will pick up ALL the dice in the OIL STORAGE and roll them near the REBOILER/COLUMN area. This phase of the game is simultaneous for all players. Using their REFINING and BY-PASS TOKENS in their supply, they will manipulate and change the dice in their possession (see REFINERY TOKENS). If a PURPLE dice rolled results in a **C₇₀₊** face, it cannot be rerolled (see Page 25).

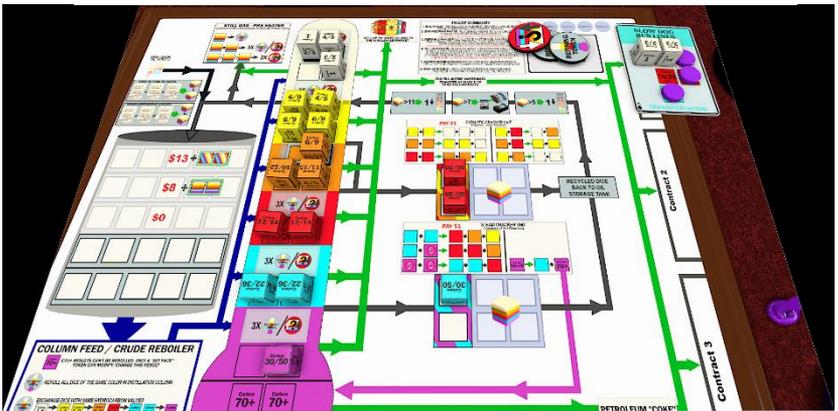
Once the player has changed, manipulated, and set their dice results by using their REFINERY TOKENS, the resulting dice must be transferred and placed into the player's distillation column and reprocessing locations. Players will transfer their dice (without changing the faces or orientation) into their DISTILLATION COLUMN, or the REPROCESSING AREA of their refinery based on specific dice color (e.g., blue dice into blue area of column). The heavier (higher carbon numbers) components are placed in the bottom region of the column (PURPLE, AQUA and RED) and lighter components (BEIGE, YELLOW, and ORANGE) at the top of the distillation column.

CHECK DICE STEP – ONCE ALL DICE HAVE BEEN POSITIONED INTO THEIR DISTILLATION COLUMN OR REPROCESSING AREAS, PLAYERS NEED TO HAVE THE PLAYER TO THEIR LEFT CONFIRM THAT ALL DICE FIT INTO LEGAL POSITIONS IN THE COLUMN OR REPROCESSING AREAS BEFORE PROCEEDING TO SELLING PHASE. IF ANY OF THEIR DICE CAN'T BE PLACED ON THEIR PLAYER BOARD, THE PLAYER MUST DISCARD THE EXCESS DICE AND INCREASE THEIR PLAYER MARKER ON THE ENVIRONMENTAL IMPACT TRACK (EIT) FOR EACH DIE DISCARDED (p 12).

KEY RULES DURING COLUMN LOADING PHASE

1. If practical, when spending REFINERY tokens players should try to announce their intentions and use of tokens, especially when exchanging different color of dice with the supply. This PHASE is on the honor system, so be honorable about the use of tokens and changing die results appropriately.

Figure 1:EXAMPLE OF LOADED COLUMN DICE POSITION



2. All dice rolled during this phase must be placed into appropriate colored positions in their refinery equipment - either in the distillation column or

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the reprocessing areas. Follow dark blue lines on the Player Board from the Reboiler (FIGURE 1).

3. When a player rolls any **PURPLE** dice, **if the C70+ face is displayed, this dice cannot be rerolled – see DETAILS and EXPLANATIONS (page 20).**
4. There are limited spaces in the player's distillation column and processing areas. If the player cannot place all the dice into the correct color and/or cannot place the dice into the reprocessing equipment, the player **MUST** discard any extra dice and move their player marker up 1 spot on ENVIRONMENTAL IMPACT TRACK for each dice discarded (see p 19).
5. Dice may **NEVER** flow backward in the process. During the **LOADING PHASE** player's dice **cannot** bypass or be returned directly to the OIL STORAGE or converted into REFINERY tokens in the STILL GAS/PRE-HEATER.

D. SELLING PHASE - GREEN LINES OUT OF DISTILLATION COLUMN

There are three steps in the SELLING PHASE which are completed in order.

1. SELL COMMODITIES TO THE WHOLESALE MARKET (TURN ORDER) - In order, players can sell up to three (3) dice to the WHOLESALE MARKET (aka "MARKET"). Players will sell to the available demand position **ABOVE** the commodity price marker and gain the corresponding money from the bank-then the commodity price marker will move up one (1) level for each set of commodities sold. The next player in turn order may sell to the MARKET if they choose, if the player does not want to sell to the MARKET, they "PASS." A player may sell multiple times to the MARKET (each time up to 3 dice) during this sub-Phase as this process will continue around the table until all players "pass" their opportunity to sell to the MARKET. Once all players have passed their opportunity to sell to the MARKET, the players transfer the dice in their distillation column to their active contracts or their reprocessing areas on their player board.

Dice that are placed in the REPROCESSING (**CATALYTIC CONVERTER OR STEAM REFORMER**) areas during the REFINING PHASE cannot be sold or placed on CONTRACTS during the SELLING PHASE. These dice can only be reprocessed and converted into recycle dice that will be returned to the OIL STORAGE for future rounds or converted into REFINERY TOKENS in the STILL GAS area.

2. TRANSFER DICE TO CONTRACTS (SIMULTANEOUS) - When players transfer their dice to contracts, players will transfer all the possible dice from their distillation column (not reprocessing area) and place them on their active contract(s).

COMPLETING CONTRACTS - If all the components on the cards have been completed, the player **MUST** immediately collect the money (VP) at the top of the card (plus any ERA bonuses) and implement any other bonus or penalties for completing the contract. They discard all their player markers and/or dice back to the supply. Players will keep their completed contracts face down near their player boards to unlock bonuses. Completing multiple contracts can unlock new workers and end game Refinery achievements. See Player Board Bonuses p22.

At the end of the SELLING phase if the contract has not been completed, players will replace all the physical dice on their contracts with their player markers to mark the completed components of their contracts, then return the dice to the general supply. No physical dice should remain on the player's contracts at the end of the round.

3. CONVERTING BEIGE (GAS) DICE TO TOKENS - Petroleum gases are difficult to store during operations. Therefore, players must either sell their beige dice to the MARKET or convert them directly to new REFINERY tokens using the STILL GAS/PRE HEATER CONVERSION during the SELLING PHASE.

CHECK DICE STEP - ALL DICE IN A PLAYER'S DISTILLATION COLUMN MUST BE SOLD, OR PLACED REPROCESSING LOCATIONS OR PLACED ON CONTRACTS BEFORE CONTINUING TO THE NEXT PHASE - REPROCESSING. IF A PLAYER CAN'T SELL OR PLACE DICE ON CONTRACTS OR INTO REPROCESSING LOCATIONS (i.e., 2 DICE COMBINATIONS), DISCARD THE DICE AND INCREASE THEIR ENVIRONMENTAL IMPACT TRACK +1 PER DIE DISCARDED.

E. PROCESSING PHASE – LIGHT GRAY HIGHLIGHT SECTION

If players don't want to sell or there is no place to sell their excess dice, players can move their unsold dice into the two reprocessing areas of their oil refinery - The upper **CATALYTIC CRACKER** for lighter components dice - Yellow, Orange and Red and lower **STEAM REFORMER** for heavier components blue and purple dice. The reprocessing equipment areas take unusable and/or excess components and convert them into "lighter" components for future rounds.

ACTIVATE REPROCESSING – PAY \$1/REPROCESSING EQUIPMENT - Players must pay \$1 to activate each piece of reprocessing equipment (so, \$2 TOTAL - to activate both the **CATALYTIC CRACKER** and **STEAM REFORMER**). Reprocessing base cost may change via game conditions (ERA cards). If a player cannot pay for the reprocessing costs, all the dice in the reprocessing equipment is discarded and players increase their marker on the ENVIRONMENTAL TRACK for each dice discarded. All dice that were placed in

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the **CATALYTIC CONVERTER** and/or **STEAM REFORMER** processing area are converted based on the current converter/reformer currently installed in on their Player Board. If a reprocessing upgrade has been purchased and installed, the activation costs remain \$1. This activation cost is NOT dependent on the number of dice in the reprocessing units, so maximize of these systems.

KEY RULE - The number of dice placed into the player's reprocessing equipment does not change the activation cost-this is a FIXED cost. All reprocessing equipment require a combination of 2 Dice to convert during REPROCESSING Phase, therefore, a single die cannot be reprocessed during the Reprocessing Phase and will be lost, and player will take environmental penalty. A PURPLE C_{50/70} is the EXCEPTION TO THIS RULE.

The total amount of dice created from these reprocessing conversions is used to qualify for the **Reprocessing Expert** Achievement card. New converted "recycle" dice do not have any hydrocarbon values nor are they considered "rolled." The new "recycle" dice are transferred back (following the grey process lines on player boards) to the player's OIL STORAGE AREA/STILL GAS/PREHEATER to be rolled next round or converted into REFINERY tokens. Depending on the number of dice recycled, players may unlock additional bonuses. The recycled dice that transferred back to the players' oil storage tank will be rerolled in the future rounds with the newly acquired CRUDE OIL TICKETS. The STILL GAS area allows the players to discard their recycled dice to gain additional REFINERY TOKENS (e.g., Flaring off excess distillates for energy).

CRITICAL RULE - ALL RECYCLED DICE MUST BE PLACED IN OIL STORAGE AND/OR CONVERTED INTO REFINERY TOKENS. IF A PLAYER CAN'T PLACE A DIE IN THEIR OIL STORAGE, THEY IMMEDIATELY DISCARD THE EXCESS DICE TO THE GENERAL SUPPLY AND INCREASE THEIR PLAYER MARKER ON THE ENVIRONMENTAL IMPACT TRACK +1 FOR EACH DICE DISCARDED.

F. REFRESH PHASE - END OF ROUND ACTIONS

1. If the ERA DECK is empty, go to FINAL SCORING.
2. If there are cards remaining in the EVENT deck, players retrieve all their ENGINEERS from MAIN BOARD. Players should replace any DICE left on incomplete contracts with their color player markers. All physical dice should be returned to supply.
3. If the 1st Player token was NOT claimed by a player during the ENGINEERING phase, it is passed clockwise to the next player. Discard any remaining CRUDE OIL TICKETS and refill face-down CRUDE OIL TICKETS based on number of players and return to ERA PHASE.

PHASE AND ACTION DETAILS AND EXPLANATIONS

A. EVENT PHASE - The event phase can have three key effects (not exclusive):

1901-1939
"AGE OF INNOVATION"

UPDATE COMMODITY MARKET
MOVE ALL COMMODITIES PRICES DOWN ONE LEVEL. SET LNG & GASOLINE TO LVL 2.

WHOLESALE CHANGES
SYNTHETIC RUBBER INVENTED!
BUTADIENE (BIGG C4'S) REQUIRED.
PLAYERS CAN SELL DICE TO THESE DEMAND LOCATIONS THIS ROUND

CARBON 4/5 Butadiene	\$8	CARBON 4/5 Butadiene
CARBON 4/5 Butadiene	\$9	CARBON 4/5 Butadiene

ENVIRONMENTAL TRACK
PLAYERS THAT DON'T FULFILLING THIS LIMITED COMMODITY DEMAND INCREASE ENVIRONMENTAL TRACK BY 1

1. Update the **WHOLESALE COMMODITY MARKET** prices as stated on the card. Move specific commodity price markers to the stated levels (LVL 1 is HIGHEST PRICE)
2. The **ERA CARDS** may have round specific "mini contracts" or **SELLING** bonuses for specific components and even some opportunities to upgrade their refinery. These specific selling opportunities are limited, and players should use their player markers to show these demands have been fulfilled. These player markers are discarded at the **END OF ROUND**, when the next **ERA CARD** is revealed.
3. There may also be an **ENVIRONMENT IMPACT TRACK (EIT)** effect that needs to be resolved or a limited time opportunity to upgrade their refinery. **ERA cards** can also cause players to lose resources (**REFINERY** tokens or even dice), so be prepared for the worst.

B. ENGINEERING PHASE (TURN ORDER)

Each player starts the game with 3 **ENGINEERS** out of their potential 5 **ENGINEERS**. There are two types of worker locations - the **ONCE PER ROUND LOCATION** and the **MULTIPLE ENGINEER LOCATION**. There is one special-colored area ("Yellow/Gold") where players can only place one engineer on a yellow/gold location. To select an **ENGINEERING** location, the player must have the necessary money at the time of selection.



MULTI-ENGINEER LOCATIONS (PAY/GAIN REWARD IMMEDIATELY)

These locations can accommodate multiple players **ENGINEERS**. If the action requires payment, the player immediately pays the indicated costs to the bank and any associated fees and takes the location's reward.



ONCE PER ROUND (PAY and/or GAIN REWARD IMMEDIATELY)

These actions can only be triggered by one player each round. Only one player's **ENGINEER** can occupy these locations, and they cannot be removed until the end of round. The rewards for the location are immediately gained except for the **Yellow/Gold** locations (see below).

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YELLOW LOCATION – ACQUIRE “FREE” CRUDE OIL TICKETS (END OF PHASE)

EACH PLAYER CAN ONLY PLACE ONE ENGINEER ON A YELLOW LOCATION EACH ROUND. When a player places their ENGINEER on one of the Gold/Yellow locations below the crude oil ticket area, they immediately flip over 1 CRUDE OIL TICKET and reveal the specific type components (represented by Colored Dice) for all players. The specific location that they placed their ENGINEER determines the order for picking OIL TICKETS at the end of the Phase.



END OF PHASE 2 - PLAYERS SELECT CRUDE OIL TICKET IN FOLLOWING ORDER



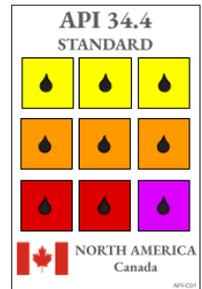
After all players' ENGINEERS have been placed on the MAIN BOARD, the CRUDE OIL TICKETS will be chosen based on the player order on this track. A player can pick ANY of the available CRUDE OIL TICKET displayed on the board. After selecting the specific OIL TICKET, the player gains the dice on the TICKET and keeps the TICKET near their player board for future benefits (see PLAYER BOARD BONUSES). Collecting specific types of OIL TICKETS may also unlock bonuses on their player board or awards for Achievement Cards.

CRUDE OIL TICKETS

All CRUDE OIL TICKETS will have a 9-cube combination that describes the components in the barrel of oil. In the example to the right, if a player chooses the OIL TICKET shown, the player will receive the following dice from the general supply:

3 X Yellow / 3 X Orange / 2 X Red / 1X Magenta

The newly acquired dice must be placed into the player's OIL STORAGE AREA with any other dice from the previous rounds or player actions. These dice will not have any face "hydrocarbon" values when in storage. Any die that cannot be stored in their oil storage is discarded, and the player's marker is increased +1 on the ENVIRONMENTAL IMPACT TRACK for each discarded die.



MAIN BOARD - ENGINEER PLACEMENT ACTIONS/LOCATIONS

There are several ENGINEERING locations for players to upgrade their distillation column and gain resources during the ENGINEERING PHASE. Not all ENGINEERING locations are available at smaller player counts - the minimum number of players needed to “unlock” the location is at the bottom right of the location.



NAME SPECIFIC GRADE “TYPE” PAY \$6

PLAYER CHOOSES “LIGHT,” STANDARD,” “MEDIUM” & “HEAVY” API TYPE. REVEAL CARDS FROM THE TOP OF CRUDE OIL RESERVE DECK UNTIL NAMED GRADE IS REVEALED – PLAYER IMMEDIATELY GAIN DICE INTO OIL STORAGE. DISCARD THE REST.



OIL EXPLORATION PAY \$5

DRAW THREE CRUDE OIL RESERVE CARDS FROM DECK AND CHOOSE ONE AND IMMEDIATE GAIN DICE INTO THEIR OIL STORAGE. DISCARD THE REST



TAKE TOP CARD OF CRUDE OIL TICKETS PAY \$3

PLAYER MAY PAY \$2 TO TAKE THE TOP CRUDE OIL TICKET AND PLACE THE DICE IMMEDIATELY INTO THEIR STORAGE.

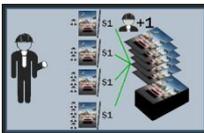


TAKE ONE CARD FROM CRUDE OIL DISCARD PAY \$5

PLAYER MAY PAY \$2 TO TAKE THE TOP CRUDE OIL TICKET AND PLACE THE DICE IMMEDIATELY INTO THEIR STORAGE.

DRAFT NEW CONTRACTS

THE ACTIVE PLAYER WILL DRAW (Number of Players +1) CONTRACTS AND SELECT ONE CONTRACT AND PASS THE REMAINING CONTRACTS TO THE NEXT PLAYER, REPEAT THE SELECTION PROCESS. THE LAST CONTRACT IS RETURNED TO THE PLAYER TAKING ACTION TO EITHER DRAFT OR DISCARD. IF A PLAYER CAN'T TAKE OR DOESN'T WANT TO SELECT A CONTRACT – THEY CAN DISCARD A CONTRACT FROM THE CHOICE OF CARDS AND TAKE \$1 FROM BANK. NOTE: A PLAYER COULD USE THIS ACTION TO EXCHANGE AN ACTIVE CONTRACT ON THEIR PLAYER BOARD.



FUTURE MARKETS (3+ PLAYERS)

PLAYER DRAW TOP 3 CARDS FROM THE CONTRACT DECK AND SELECTS ONE CONTRACT AND PLACES REMAINING CONTRACTS IN DISCARD PILE.



MISSED CONTRACT OPPORTUNITY PAY \$2

SEARCH FOR ONE CONTRACT IN DISCARD PILE AND PLACE IN ACTIVE CONTRACT AREA, RETURN THE OTHER CONTRACTS TO DISCARD PILE. THE FULL CONTENTS OF THE DISCARD PILE ARE **NOT** PUBLIC INFORMATION (JUST TOP CARD).



PURCHASING AND INSTALLING UPGRADE IN DISTILLATION COLUMN

WHEN AN UPGRADE IS PURCHASED AND PLACED, PLAYER RECEIVES REWARDS ON THE MAIN BOARD AND THEIR PLAYER BOARD.

BASIC COLUMN UPGRADES (VARIOUS REWARDS) PAY \$5/6

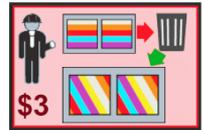
PLAYER PAY \$X AND SELECTS ONE OF THEIR BASIC UPGRADES (SOLID COLOR) TO PLACE IN THEIR DISTILLATION COLUMN. THE UPGRADED COLOR MUST MATCH THE DISTILLATION COLUMN COLOR (RED UPGRADE = RED DISTILLATION SPACE).



BEIGE UPGRADE MUST BE UPGRADED IN ORDER (Level 1, 2 3). PREVIOUS BIEGE UPGRADES MAY MOVE UP IN THIS SECTION OF DISTILLATION COLUMN. BOTH UPGRADE POSITIONS RECEIVE INSTALLATION BONUS.

DISCARD BASIC UPGRADE GAIN ADV. UPGRADE PAY \$3

DISCARD ONE BASIC UPGRADE AND PURCHASE ADVANCE UPGRADE FOR DISTILLATION COLUMN FOR \$3. UPGRADED PIECE MUST HAVE AT LEAST ONE COLOR OF THE DISCARDED BASIC UPGRADE.



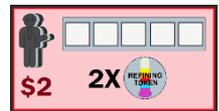
BASIC & ADVANCE COLUMN UPGRADE PAY \$10

UPGRADE ONE BASIC AND ONE ADVANCE POSITION IN YOUR DISTILLATION COLUMN FOR \$10.



OIL STORAGE EXPANSION (UNLIMITED) PAY \$2+

PLAYERS WILL GAIN ONE EXPANSION PIECE FOR THEIR OIL STORAGE. THEY PAY \$2 + ANY ADDITIONAL COSTS ON THEIR PLAYER BOARD. ANY REWARD UNLOCKED FOR THE EXPANSION ARE ALSO GAINED DURING THIS ACTION.



ACQUIRE FIRST PLAYER AND COMMODITY BONUS

PLAYER GAINS 1st PLAYER TOKEN AT THE START OF NEXT PHASE. IF A PLAYER'S ENGINEER IS ON THIS LOCATION, THEY ALSO GAIN **+\$1/COMMODITY** LEVEL SOLD TO ONLY THE **WHOLESALE MARKET OR ERA CARD** FOR THIS ROUND'S SELLING PHASE (see below). THE FIRST PLAYER TOKEN **DOESN'T** PASS DURING THE REFRESH PHASE IF SELECTED.





WHOLESALE MARKET SELLING BONUS

WHEN A PLAYER PLACES AN ENGINEER ON THIS LOCATION THEY WILL GAIN A SELLING BONUS FOR THE **WHOLESALE MARKET OR ERA CARDS**, not CONTRACTS. EACH COMMODITY LEVEL THEY SELL WILL RECEIVE **\$1 BONUS** during the current SELLING Phase.

EXAMPLE: Player sells 1 BIEGE and 2 RED dice (3 total dice – 2 different commodity levels); the player receives the normal MARKET price for selling the commodities and receives an additional +\$2 (+\$1 for each level sold).

BUY WHOLESALE OIL (VARIABLE \$)



PURCHASE UPTO FOUR COMMODITY DICE FROM THE WHOLESALE MARKET AT THE PRINTED PRICE ABOVE THE COMMODITY MARKER. IF NO MARKER EXIST, THE PURCHASE PRICE IS THE HIGHEST PRICE ON THE WHOLESALE MARKET. PURCHASED DICE HAVE NO CARBON VALUE AND ARE IMMEDIATELY PLACED IN PLAYERS OIL STORAGE.

SELL TO WHOLESALE COMODITY MARKET (VARIABLE \$)



SELL UP TO FOUR DICE FROM YOUR OIL STORAGE AREA TO THE WHOLESALE MARKET AND/OR FULFILL 1 ERA DEMAND. DICE SOLD DURING THIS ACTION CAN'T REQUIRE SPECIFIC CARBON VALUES FACES.

PLAYER BOARD – DETAILS AND BONUSES



GAIN TWO OF THE DICE - THREE MATCHING OIL TICKETS

PLAYERS MAY TURN-IN (“TUCK”) THREE OIL TICKETS WITH MATCHING GRADE TO IMMEDIATELY GAIN TWO DICE OF THE SAME COLOR INTO THEIR STORAGE TANK. THIS ACTION CAN BE TRIGGERED FOR MULTIPLE SETS OF CARDS.



GAIN TWO DIFFERENT DICE - THREE DIFFERENT OIL TICKETS

PLAYERS MAY TURN-IN (“TUCK”) THREE OIL TICKETS WITH THREE DIFFERENT GRADES TO IMMEDIATELY GAIN TWO DIFFERENT COLORED DICE INTO THEIR STORAGE TANK. THIS ACTION CAN BE TRIGGERED FOR MULTIPLE SETS OF CARDS.



RECYCLE ≥6 DICE FROM REPROCESSING EQUIPMENT

IF A PLAYER RECYCLES 6 or MORE DICE FROM THEIR REPROCESSING EQUIPMENT, THE PLAYER MAY DECREASE THEIR PLAYER MARKER 1 POSITION ON THE ENVIRONMENTAL IMPACT TRACK (-1).

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RECYCLE ≥8 DICE FROM REPROCESSING EQUIPMENT

IF A PLAYER RECYCLES 8 or MORE DICE FROM THEIR REPROCESSING EQUIPMENT, THE PLAYER CAN DRAW 3 CONTRACTS AND SELECT 1. DISCARD THE OTHER 2.



RECYCLE ≥14 DICE FROM REPROCESSING EQUIPMENT

IF A PLAYER RECYCLES 14 or MORE DICE FROM THEIR REPROCESSING EQUIPMENT, THE PLAYER MAY DECREASE THEIR PLAYER MARKER 1 POSITION ON THE ENVIRONMENTAL IMPACT TRACK (-1).



TWO CONTRACTS COMPLETED

IF A PLAYER COMPLETES 2 CONTRACTS, THEY IMMEDIATELY GAIN AN EXTRA ENGINEER FROM THEIR SUPPLY FOR THE NEXT ROUND. IF A PLAYER COMPLETES 4 CONTRACTS, THEY WILL GAIN THEIR FINAL ENGINEER.



COMPLETE THREE CONTRACTS (ONCE PER GAME)

WHEN A PLAYER COMPLETES THREE CONTRACTS, THEY DRAW FOUR CARDS FROM THE ACHIEVEMENT DECK ADDING THEM TO THE ORIGINAL ACHIEVEMENT CARD DEALT AT START OF GAME. REVIEWING ALL 5 CARDS, THE PLAYER SELECTS ONE ACHIEVEMENT WHICH BECOMES A PUBLIC POTENTIAL ACHIEVEMENT FOR ALL PLAYERS. PLACE THE NEW ACHIEVEMENT NEAR THE MAIN GAME BOARD. ANY PLAYER MAY QUALIFY FOR THIS NEW PUBLIC ACHIEVEMENT WITH THEIR COMPLETED CONTRACTS OR ACQUIRED CARDS. IF THE PLAYER DOESN'T CHOOSE AN ACHIEVEMENT CARD, THEY MUST INCREASE THEIR ENV. IMPACT TRACK +1



C. REFINING PHASE - COLUMN LOADING (BLUE PROCESS LINES)

During this phase, players will gather their crude oil dice from their OIL STORAGE location, roll all of them and manipulate their “crude oil” into specific colors and carbon values (faces) they need to complete contracts. Players will do this phase simultaneously in the open of all other players.

CRITICAL RULE - DICE MAY NEVER FLOW BACKWARD AND CAN'T BE RETURNED TO THE OIL STORAGE AREA. DICE MUST FOLLOW PROCESS LINES ON THE PLAYER'S REFINERY BOARDS.

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COLUMN LOADING RULES

Players MUST transfer **ALL DICE** in their OIL STORAGE areas to the BOILER ROLLING area to be rolled. Players will simultaneously roll their component dice in the open. Players can use the two types of REFINING TOKEN (BASIC REFINING and BY-PASS TOKENS) to change their specific dice results to try and produce sellable distillate products for WHOLESale or their CONTRACTS.

ALL DICE ROLLED DURING THE REFINING PHASE MUST BE PLACED INTO AVAILABLE POSITIONS ON THE PLAYER'S REFINERY BOARD - EITHER IN THE DISTILLATION COLUMN OR THE REPROCESSING AREAS (i.e., CATALYTIC CONVERTER or STEAM REFORMER). The distillation column and reprocessing areas have limited positions for player's dice. If a player cannot place a die in the correct color of the distillation column or the correct colored reprocessing area - The player must discard the excess dice and increase their ENVIRONMENTAL IMPACT TRACK (EIT) +1 for each dice discarded.

THERE IS AN INHERENT ELEMENT OF TRUST WHEN PLAYERS MANIPULATE/ EXCHANGE THEIR DICE RESULTS SIMULTANEOUSLY DURING THIS PHASE. WHEN SPENDING TOKENS PLAYERS SHOULD TRY TO ANNOUNCE THEIR ACTIONS/INTENTIONS, ESPECIALLY WHEN EXCHANGING DICE COLORS WITH BYPASS TOKENS. PLAYERS CAN PLACE THEIR DICE ONTO THEIR ACTIVE CONTRACTS DURING THE REFINING PHASE TO HELP VISUALIZE THE CONTRACT REQUIREMENTS. HOWEVER, JUST MAKE SURE ALL DICE CAN LEGALLY FIT INTO THE PLAYER'S DISTILLATION COLUMN/REPROCESSING AREAS PRIOR TO STARTING SELLING PHASE. PLAYERS MAY BE NOT ABLE TO LEGALLY FIT ALL DICE INTO THE PROPER COLORED REFINERY LOCATIONS AND WILL NEED TO CORRECT THESE ERRORS. IF AN ERROR WAS MADE IN USING TOKENS or CHANGING DICE FACES, TRY TO RETURN THE GAME BACK TO THE ORIGINAL STATE PRIOR TO THE ERROR.

REFINERY TOKENS – HOW DICE ARE MANIPULATED

REFINERY TOKENS represent the energy and chemical processes used inside the refinery to change and separate the hydrocarbons flowing through the pipes. There are two different REFINERY TOKENS that are used to manipulate and modify the crude oil dice rolled during the REFINING PHASE. Spending REFINERY TOKENS to modify the die faces and colors is the primary method of obtaining the correct results to fulfill active CONTRACTS and/or satisfy the specific ERA card demands. The two different REFINERY TOKENS can be spent in any order to obtain the required results on player's dice. Multiple REFINING TOKENS can be spent on the same dice to achieve desired results.

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BYPASS (RED) TOKEN - When a player spends a BY-PASS token, they can manipulate their dice results in two separate ways:



- 1. SET THE FACE of ONE DICE – SPEND ONE TOKEN** – Set one carbon value (face) of any one dice in reboiler/distillation column.
- 2. EXCHANGE COLOR – SPEND ONE TOKEN** - Exchange one dice for any other color dice up to three colors in difference based on the distillation column color and reroll the new dice. NOTE: This BYPASS function could be used as a “REROLL” if the player exchanged the same color dice.



EXCHANGE OF DICE EXAMPLES:

BEIGE → RED, ORANGE, or YELLOW.

YELLOW → TO BEIGE PINK, ORANGE, RED OR BLUE

ORANGE/RED → TO ANY OTHER COLOR

AQUA/BLUE → MAGENTA, RED, ORANGE, or YELLOW

PURPLE/MAGENTA → BLUE, RED or ORANGE

BASIC (GRAY) REFINING TOKEN - The basic REFINING TOKEN allows the player to manipulate their dice results in two ways:

- 1. REROLL ACTION – SPEND ONE REFINING TOKEN** - REROLL all of one color of dice. The player MUST reroll all the same-colored dice. Any PURPLE dice showing a C₇₀₊ face cannot be rerolled. Only the BY-PASS token can change a C₇₀₊ result.

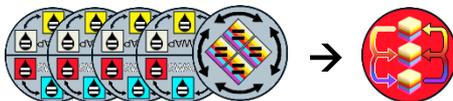


- 2. SWAP HYDROCARBON VALUE – SPEND ONE REFINING TOKEN** – SWAP one color dice with same hydrocarbon value as neighboring color dice. Here are the potential SWAP actions for dice (see below)



This powerful action allows a player to upgrade or downgrade between the specific hydrocarbon values of two different colored dice. **NOTE:** There is NO SWAP potential between the ORANGE and RED colored dice.

EXHANGING REFINERY TOKENS – During REFINING PHASE, players may exchange 5 basic REFINING tokens for 1 BYPASS token at any time.



PURPLE DICE represents the heaviest and most difficult hydrocarbon compounds to process in the barrel of crude oil. So, when they are present in your CRUDE OIL

Carbon
70+

TICKET, they can cause production issues and may not be capable of being converted into usable/sellable products. When a player rolls any **PURPLE** dice, **if the C₇₀₊ face is displayed, this dice cannot be rerolled.** However, a C₇₀₊ result can be modified by spending a BYPASS token to either **SET THE FACE** or **EXCHANGE THE DICE COLOR** during the REFINING PHASE. Any dice with the C₇₀₊ face that is not changed or cannot be changed is transferred end the end of the selling phase to the bottom area of the player's distillation column in the four spots labelled C₇₀₊ and the player marks off the location with their player marker. The purple dice are returned to the general supply once marked. Once marked, these C₇₀₊ positions in the column count as "dice" that can be sold during the SELLING phase, but they cannot be rerolled or changed on future turns.

STRATEGY NOTE: A limited number of CONTRACT CARDS and/or ERA CARDS require these C₇₀₊ components commonly called petroleum coke, but these contracts or ERA card demands specifically have C₇₀₊ requirements listed.

DE-COKING COLUMN (UNPLANNED MAINTENANCE)

If all four C₇₀₊ positions in a player's column are filled and the player needs to place another C₇₀₊ die at the end of the SELLING PHASE, the player must immediately discard ALL their current C₇₀₊ purple dice in the bottom of their distillation column and move their player marker up the ENVIRONMENTAL IMPACT TRACK for each purple dice discarded (+4). This action represents the need for refineries to shut down and clean out the PETROCOKE sponge from their systems. There are a few ERA cards and CONTRACTS that can use this "waste" product as a fuel source in their production – like metal processing and forging, so selling this "waste" material is always a better strategy if possible.

D. SELLING PHASE (TURN ORDER) – GREEN PROCESS LINES

During this phase, players will take turns transferring (selling) the dice from their individual column locations. The GREEN process lines flowing out of the distillation column represent the three potential SELLING actions on their Player Boards:

- 1) Sell the 3 dice to WHOLESALE MARKET "MARKET" commodity demands.
- 2) Transfer Dice in Distillation Column to fulfill active Contracts.
- 3) Convert the Beige Dice (Gasses) into new REFINERY tokens.

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1. SELLING DICE TO THE WHOLESALE COMMODITY MARKET

The first part of the SELLING PHASE allows players to sell dice in their distillation column to the WHOLESALE COMMODITY MARKET (aka “MARKET”). In turn-order, players may sell up to three (3) dice to the MARKET commodities or the special demand locations that may appear on ERA CARDS. If a player does not want to sell to the MARKET, they “pass” and prepare to transfer the rest of their dice to active contracts or REPROCESSING equipment. Selling to the WHOLESALE MARKET continues until all players, “pass.” Players must fulfill all the dice (1,2 or 3 dice) indicated for the specific commodity to gain the money from the sale. When a player sells dice to a specific MARKET commodity, the player discards the dice back to the supply, gains indicated money printed ABOVE the specific commodity marker and then moves the commodity price marker up to one level. When the commodity price marker is at a specific position, no other player can sell at a price below the marker. If a commodity has reached the infinity (∞) symbol, players can always sell to this location/price. FUEL OIL/PARFFIN (aqua) and ASPHALTENE (purple) are limited demand markets and cannot be sold-to if they reach the top of their MARKET (no remaining demand). The highest commodity demand level – LEVEL 1 (LVL 1 = highest price) is the bottom level of each commodity track.



2. TRANSFER DICE TO ACTIVE CONTRACTS

After all players have “passed” selling to WHOLESALE MARKET, players will transfer the remaining dice in distillation column to their contracts. Once all components on a contract have been fulfilled with dice and/or player makers, the player MUST immediately claim the contract’s reward. In the CONTRACT example to the right, a player would have to have 5 beige dice with faces showing $C_{2/3}$, two orange dice with $C_{6/9}$ and $C_{10/12}$, and finally two red or aqua dice with one $C_{16/20}$ faces to be fulfilled. If the contract is not fully completed within a round, any dice placed during the SELLING PHASE will be replaced with the player’s specific markers and all the dice placed on contract are returned to supply. When players place their markers on a contract, the markers stay on contract cards until the contract is completed, which may take multiple rounds. Players do not receive the contract’s reward until all components are fulfilled.



Players may only have three (3) active contracts at any time. The difficulty of the contract is shown in the bottom left corner with 1 to 4 dots (4 being the most difficult). The completed contracts kept by the players are not public knowledge. Completed contracts may allow players to qualify for end of game Achievement

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Card bonuses and will unlock additional player resources on their Player Boards (page 22). There are four categories of contracts representing the various end customers for the oil distillate products:

CONSUMER (Purple) – Gasoline stations, Soaps, Adhesives, Paint

TRANSPORTATION (Aqua) – Trucking, Railroad, Marine, Airlines Companies

CHEMICALS (Green) – Adhesives, Dyes, Fabrics, Rubber, Pharmaceuticals

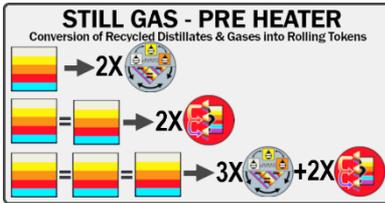
POWER & UTILITY (Tan) – Power Generation, Natural Gas, Foundries, Services

Several contracts may have dual end customer markets. These contracts may only qualify for one specific end customer market when scoring Achievements Cards at the end of the game.

3. CONVERT BEIGE DICE TO REFINERY TOKENS

ONLY Biege dice can be converted into REFINERY TOKENS during Selling Phase.

After transferring dice to contracts, players must convert all BIEGE DICE not sold to WHOLESALE MARKET or placed onto contract into REFINERY TOKENS using the STILL GAS CONVERSION area before moving to the REPROCESSING phase. Any TOKENS gained during this PHASE may not be used to change die results during this SELLING phase.



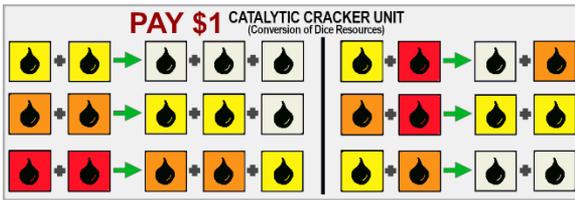
Any (non-beige) dice that is not sold and remains in the player's column must be moved to either the CATALYTIC CONVERTOR OR STEAM REFORMER areas in the REPROCESSING AREA if possible. If the player does not have room in reprocessing areas, they must discard any extra dice to the supply and increase their player marker (+1) one position on the ENVIRONMENTAL IMPACT TRACK for each dice discard in this manner.

The **SELLING** phase is not complete until all available dice in each player's distillation column has been sold, transferred to contracts, converted to tokens in the STILL GAS area (BIEGE), moved to the REPROCESSING equipment, or discarded and ENVIRONMENTAL IMPACT TRACK adjusted.

E. REPROCESSING PHASE (GRAY PROCESS LINES)

After selling all available dice, players will convert all the dice placed in their REPROCESSING EQUIPMENT areas (**CATALYTIC CONVERTER** or **STEAM REFORMER**). The REPROCESSING operation costs the player \$1 for each reprocessing operation they will trigger- this cost is NOT affected by size (available dice slots) of equipment. If the player does not have money to operate their reprocessing equipment, discard all dice in the equipment and increase their player marker on the ENVIRONMENTAL IMPACT +1 for each dice discarded. Make sure you have money for reprocessing costs!

The specific dice reprocessing conversion rates are shown on the two reprocessing areas on their player board - **CATALYTIC CRACKER** and **STEAM REFORMER**. The

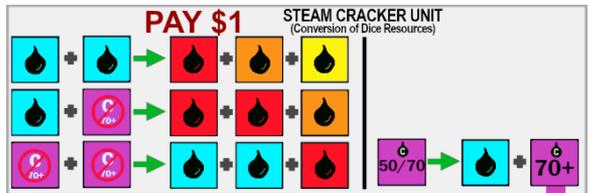


resulting “recycled” dice can then either be returned to player’s OIL STORAGE or converted for REFINERY TOKENS for future rounds. Depending on the number of recycled dice returned, the

player may qualify for additional bonuses shown on their Player Board (page 18).

KEY RULE: All reprocessing spaces require a minimum of two dice to reprocess.

Therefore, single dice placed into the reprocessing areas must be discarded and the player must increase their ENVIRONMENTAL IMPACT TRACK by 1. NOTE: A single purple dice with a value of 50/70 is the exception to this 2-die rule.



Any recycled dice created and returned from the REPROCESSING equipment may have two potential uses:

- 1) This dice may be converted into REFINERY tokens in the **STILL GASES/PRE-HEATER** (page 23) area on the refinery recycle path or
- 2) the dice can be returned to the player’s OIL STORAGE to be rolled in the next round. Any dice not converted into REFINERY TOKENS are placed back in the player’s oil storage area (no specific hydrocarbon values) for the next round. Any dice that cannot fit in OIL STORAGE must be discarded, and the player increase their player marker one position on the ENVIRONMENTAL IMPACT TRACK for every die discarded.

F. REFRESH PHASE - END OF ROUND/END OF GAME CHECK

1. If the ERA DECK is exhausted, the game is over; go to FINAL SCORING.
2. If there are ERA cards left in the ERA deck, players retrieve their ENGINEERS from the MAIN BOARD, discard any unclaimed CRUDE OIL TICKETS, and refill the CRUDE TICKETS face-down based on the number of players +1.
3. Start next Round by returning to ERA Phase and revealing the next ERA card.

FINAL SCORING

Final scoring is calculated by the following:

1. CAPITAL (\$) AT END OF GAME AFTER FINAL SELLING PHASE

2. REMAIN REFINING TOKENS:

By-Pass/Set-Face (Red) = \$1/3 Tokens or Reroll/Swap (Gray) = \$1/5 Tokens

3. REMAINING DICE IN OIL STORAGE AREA: \$1/3 DICE (Any Color-NOT C₇₀₊)

INCOMPLETE CONTRACTS: \$1/per contract + \$1 per fulfilled component

ACHIEVEMENT CARD BONUSES: Award each public ACHIEVEMENT CARD that a player qualified. Each completed contract may only qualify once for Achievement Card bonuses.

ENVIRONMENTAL IMPACT TRACK (EIT): Player with highest EIT position “Dirtiest” Refiner - Lose \$10, 2nd Lose \$5, 3rd Lose \$3, “Cleanest” Refiner \$0. If a player has been able to move their marker to the green area of the track, they will receive the \$5 bonus. All tied players lose \$ value for specific position (e.g., tied for 1st both players lose \$10). In less than 4 players, eliminate middle position penalties (e.g. 3-players award \$10, \$5, \$0).

PLAYER	CAPITAL END GAME (\$)	INCOMPLETE CONTRACTS/ TOKENS / DICE (\$)	ACHIEVEMENT CARDS (\$)	ENVIRONMENTAL IMPACT TRACK (\$)	TOTAL VP (\$)

REFINERY TYCOON

The player with the most money is declared the winner- “Refinery Tycoon.” If players are still tied, the player with the most TECHNOLOGY points wins (most refinery capacity). If still tied, the player with the most ADVANCE and REPROCESSING upgrades is declared winner.

REFINED PLAYER REFERENCE SUMMARY

1. ERA PHASE - REVEAL ERA CARD

- a. Read ERA and Historic Context- Adjust Commodity Prices on WHOLESALE MARKET.
- b. ENVIRONMENTAL TRACK update/action is applied to players-pay any penalties to BANK (if applicable).

2. ENGINEER PHASE - ASSIGN ENGINEER TO MAIN BOARD LOCATIONS

- a. In turn order, each player places one ENGINEER (worker) from their supply onto MAIN BOARD. A player may only place one ENGINEER on a YELLOW LOCATION each round.
- b. After all ENGINEERS are placed, Select Crude Oil Ticket based on yellow selection order on board.

CHECK DICE - ALL DICE GAINED AT THIS PHASE MUST FIT IN PLAYERS OIL STORAGE AREA

3. REFINING PHASE - LOADING DISTILLATION COLUMN - ROLLING DICE

- a. Simultaneously, players MUST take all dice in their OIL STORAGE areas and roll them.
- b. Players can spend the 2 types of REFINERY TOKENS to modify (see below) their dice results in any order.
- c. Once all the dice modifications and manipulations have been accomplished the dice are transferred into the player's column locations or reprocessing areas based on the color of the dice (e.g. BLUE DICE IN BLUE AREAS) PURPLE C70+ DICE RESULTS CAN NOT BE REROLLED ONLY "SET FACE" TOKEN CAN MODIFY THIS ROLL

CHECK DICE - ALL DICE ROLLED AT THIS PHASE MUST FIT INTO THE PLAYER'S DISTILLATION COLUMN OR REPROCESSING AREAS. DICE PLACED IN PLAYER'S REPROCESSING AREAS CAN'T BE SOLD IN PHASE 4

4. SELLING PHASE - GREEN PROCESS LINES FROM DISTILLATION COLUMN

In turn order, players can do the following actions:

A. SELLING TO WHOLESALE MARKET -A player can sell up to three dice to commodity market and gains the money from the bank and move the commodity pricing marker on the track. No other player can sell dice for that specific price/demand. Return the sold dice back to supply. This action continues around the table continue until all players have passed their opportunity to sell.

B. TRANSFERRING TO CONTRACTS - Player can transfer any number of their dice to active contracts. If a CONTRACT is completed, the player immediately gains reward and/or BONUSES on PLAYER BOARD. If a contract is NOT completed at the end of SELLING phase, the player marks the complete components with their color markers and returns physical dice to supply.

C. BEIGE DICE NOT SOLD to MARKET must be converted into REFINERY TOKENS in "STILL GAS/PRE-HEATER"

KEY RULES FOR SELLING PHASE

-DICE PLACED IN REPROCESSING AREA (CATALYTIC CONVERTER OR STEAM REFORMER EQUIPMENT) DURING PHASE 3 CAN'T BE SOLD TO WHOLESALE MARKETS OR PLACED ONTO CONTRACTS DURING THIS PHASE.

- BEIGE DICE NOT SOLD IN COLUMN MUST BE CONVERTED INTO REFINERY TOKENS.

- MARK COMPONENTS THAT ARE FULFILLED ON UNCOMPLETED CONTRACTS FOR NEXT ROUNDS

CHECK DICE - ALL DICE IN PRODUCT COLUMN MUST BE SOLD, CONVERTED TO TOKENS OR PLACED ON CONTRACT BEFORE CONTINUING TO PHASE 5: REPROCESSING

5. REPROCESSING PHASE - COST \$1/PROCESSING EQUIPMENT (GREY LINES)

- a. Players must pay \$1 each to operate their reprocessing equipment - CATALYTIC CONVERTER or STEAM REFORMER. Adding reprocessing upgrades to PLAYER BOARD does not change this cost.
- b. Players convert dice place in REPROCESSING EQUIPMENT using the conversions for on the specific equipment. **NOTE: Reprocessing steps require a minimum of TWO DICE, single die can't be converted or reprocessed and MUST be discard with ENVIRONMENTAL PENALTY. PURPLE C50/70 are exceptions to this rule.**
- c. The new converted "recycled" dice gained are then transferred to either the player's OIL STORAGE AREA or converted ("flared") in the "STILL GAS/PREHEATER" area to gain REFINERY TOKENS for future rounds.

6. REFRESH PHASE - END OF ROUND / END OF GAME

- a. If the ERA DECK has more cards continue to next round else go END OF GAME scoring.
- b. Return ALL player's engineers back to PLAYER BOARDS, Refill CRUDE OIL TICKETS RETURN ERA PHASE.

ENVIRONMENTAL IMPACT TRACK ("EIT")

PLAYERS' MARKER START GAME ON "5". WHEN A PLAYER LOSES ANY NUMBER OF DICE DURING ANY PHASE DUE TO LACK OF STORAGE, PROCESSING CAPACITY AND/OR REPROCESSING REQUIREMENTS (i.e. SINGLE DICE), THEY INCREASE THEIR PLAYER MARKER ON THE TRACK EQUAL TO THE NUMBER OF DICE DISCARDED DURING THE PHASE. THE PLAYER WITH HIGHEST IMPACT SCORE WILL PAY THE FOLLOWING PENALTY AT END OF GAME (TIES ALL PLAYERS PAY HIGHEST FINE):

HIGHEST IMPACT: \$10 - 2nd HIGHEST IMPACT: \$5 -3rd HIGHEST IMPACT \$3 - LOWEST IMPACT \$0

IF A PLAYER IS ABLE TO REDUCE THEIR POSITION ON THE TRACK TO GREEN BOTTOM AREA, THEY WILL GAIN +\$5 AT END OF GAME. SOME ERA CARDS WILL ALSO CAUSE PLAYERS TO PAY A PENALTY BASED ON THEIR TRACK POSITION.

REROLL DICE - REROLL ALL dice of same color.

EXCHANGE - Change of die up to 3 color difference.



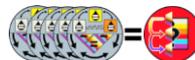
OR

SWAP COLOR OF DICE with same Carbon Value



OR

SET FACE - Set Hydrocarbon Value of one die.



ENVIRONMENTAL IMPACT TRACK (EIT)	
\$1	10
\$5	9
\$3	8
\$10	7
\$5	6
\$3	5
\$1	4
\$0	3
\$0	2
\$0	1
- \$5 PENALTY FOR HIGHEST IMPACT +\$5	