# Rivals — A Nuclear Weapon Proliferation Simulation

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> "Different strategies of proliferation have different likelihoods of success and provide different vulnerabilities that can be leveraged by nonproliferation policies to try to stop states from obtaining nuclear weapons. As the world finds itself in a new nuclear era now thirty years after the end of the Cold War, understanding the dynamics and consequences of the proliferation process—which strategies of proliferation are available to states, which strategy a nuclear aspirant might select and why, and what the international community can do to thwart nuclear proliferation depending on the aspirant's strategy—is critical to global security."[1]

> "If India makes an atom bomb, then even if we have to feed on grass and leaves—or even if we have to starve—we shall also produce an atom bomb as we would be left with no other alternative. The answer to an atom bomb can only be an atom bomb." —Zulfikar Ali Bhutto, 9th Prime Minister of Pakistan[2]

## 1 Introduction

The world faces severe risks of regional proliferation of nuclear weapon capability. By putting participants in the roles of competing regional powers, this simulation employs a methodology of learning through experience to share and reinforce what may seem like abstract concepts in nuclear weapon technology and politics. Players will practice decision-making in conditions of uncertainty and, through the simulation, players will gain a more direct and salient understanding of the forces and constraints affecting nuclear weapon proliferation today — as well as the likely consequences arising from the choices available to states. This sort of experiential learning is also meant to be a counter to wishful thinking and the practice of simply assuming that unwelcome developments will not occur.

*Rivals* is an interactive simulation for five Players and one Referee, modeling elements of regional nuclear weapon proliferation. Five Players represent fictional countries: Helium (He), Neon (Ne), Argon (Ar), Krypton (Kr), and Xenon (Xe). The countries have demographic and geographic features, but are not modeled geographically for the purposes of the game. They are all close enough to be considered adjacent as far as nuclear weapons are concerned. The game also does not model military conflict or war: simply the dynamics of a potential regional arms race. **All Players can win** if progress to weaponization is limited to just Helium and Neon. If it progresses further, each Player has a Score calculated based on the nuclear balance of power between allies and enemies, as well as other factors like global and domestic reputation.

[1] Vipin Narang. *Seeking the Bomb: Strategies of Nuclear Proliferation*. Princeton: Princeton University Press, 2022, p. 2.

[2] Feroz Hassan Khan. *Eating Grass: The Making of the Pakistani Bomb*. Stanford: Stanford University Press, 2012, p. 6–7, 204.

# Contents

## 1.1 Elements in each Turn

The game is played in 10 Turns, each representing about 1.5 years. In each Turn, Players will take Public Actions, discussed in conference with one another, and Private Actions, conveyed to the Ref in a one-on-one meeting.

Each turn consists of:

1. an update from the Ref on the state of the game,
2. issuing of Action Point (AP) tokens by the Ref,
3. a conference on Public Actions among all parties,
4. private one-on-ones with the Ref to select Private Actions,
5. casting a 20-sided die in conference to provide probabilistic inputs as needed,[3]
6. a private distribution of Radiological Contamination Tokens to Players operating fuel cycle Equipment
7. and notification of the Players (in conference or privately as appropriate) about the effects of all Actions taken that Turn.

During one-on-one meetings between Players and the Ref, other Players may negotiate as they wish. At the end of every Turn, the success or failure of each Player Action is determined in part via dice throws. The random component of each Action varies and is estimated in the Action Menu.

Being able to take action effectively depends on keeping in power. At the beginning of each Turn, the Ref shall inform each Player of whether they were overthrown in a Military Coup or Popular Uprising.

## 1.2 Player equipment

Each Player receives:

- a Completion Card — shows the degree of completion of the Player's potential weaponization program
- a Privacy Screen — conceals the true extent of your progress from all other players
- an Action Menu — a list of all the choices you can spent Action Points on, with estimated odds of success
- an Action Roster — a place to record your Actions formally so the Ref can calculate their results
- padded envelopes — to unobtrusively exchange tokens or notes
- and a pencil and eraser — to be able to reversibly alter their Completion Card.

The Completion Card allows Players to privately track their progress (if they so choose) toward nuclear weapon capability, kept confidential from other Players by the Privacy Screen. The Action Menu lists all possible Actions which may be taken by each player, their associated AP cost, and an estimate from your Intelligence Services of the plausible outcomes and their respective likelihoods. The Action Roster formally records all Player choices, allowing the Ref to perform the necessary end-of-term calculations. For example, an effort to sabotage an opponent's Equipment may lead to success or failure depending on a combination of Intelligence Service Competence and a dice throw. A successful Action would destroy a Block of a chosen Player's Equipment; an unsuccessful Action will worsen relations between the two Players.

Players must use their Privacy Screens to conceal the true extent of their weaponization program. Players may use the Privacy Screen at their discretion, with regard to Action Points and Radiological Contamination Tokens. For instance, a player may choose to show unspent Action Points publicly to reassure other Players that they have not been spent on clandestine Actions. Similarly, players may choose to show Radiological Contamination Tokens to convey that they have a well-developed program and increase the desire of other Players to improve their relationship value. If the security situation in the region deteriorates further, it may be desirable to have friendly relations or a mutual defence agreement with a nuclear weapon state, or one on the threshold of such capability.

## 1.3 Referee equipment

A 20-sided die is shared for when probabilistic events are to be modeled. In each case where the success or failure of an Action is being calculated, the Ref will include the player's dice cast along with other relevant statistics in an Excel calculation for success or failure.

[3](Success or failure of Actions, government stability in the next Turn, and other throws as needed)

The Ref maintains a publicly visible whiteboard which shows the present state of relations between all Players, and between each Player and the World Nuclear Powers. These scores are updated at the end of Turns or when necessary. For changes that result from clandestine Actions, Players may see the result but not the cause, or the Ref may reveal a failed Action which resulted in deterioration of a relationship.

The Ref uses an Excel spreadsheet to input Player Actions from the Action Roster and to determine the success or failure of Player efforts. Depending on the Action in question, inputs to whether it will succeed or not include: the Player's dice roll, the Player's Intelligence Service Competence, the Player's relationship with a target Player, the Player's relationship with the World Nuclear Powers, and the Player's Public Sentiment score.

## 1.4 Scoring

Each Player's Score at the end of the game is calculated based on the nuclear balance of power between their allies and enemies, ranked by weight of friendship or enmity.

Two possible Score calculations may be employed:

1. If no Player other than Helium and Neon have crossed into weaponization — A high positive score (80) is awarded to all Players (*Status Quo* Win)
2. If any Player, other than Helium and Neon, Announce weapon capability or Test a weapon, each Player receives a score based on nuclear capability of Friends and Allies minus that of Rivals and Enemies

The *Status Quo* Win is only possible if no state conducts a nuclear test or declares weapon capability.

Each Player's progress toward weaponization is issued a Score based on working through the following milestones:

- Full energy Equipment (25% progress)
- Full fuel cycle Equipment (50% progress)
- Full weaponization Blocks (80% progress)
- Full weaponization Blocks with a verified design (obtained from a friendly World Nuclear Power) (90% progress)
- Weaponization Announced (90% progress, or 95% with a verified design)
- Weapon Tested (100% progress)

Weaponization consists of producing weapons-grade fissile materials, machining weapon cores, mastering the production of explosives for implosion-based weapon designs, and developing organizational routines to manage nuclear weapons.[4,5]

If players aside from Helium and Neon have crossed into weaponization and the second scoring calculation is used. Each score is made up of several parts, as when grades from several assignments and exams in a course collectively add to something between 0-100%. The inputs for each Player's score are:

- The Player's own level of progress toward weaponization (35%)
- All other Player's progress toward weaponization, weighted by their degree of friendship or enmity with the Player whose score is being calculated (35%)
- The Player's relationship with the World Nuclear Powers (10%)
- The Player's Public Sentiment score (10%)
- The number of Radiological Contamination Tokens held by the Player, with full points for no tokens and a decreasing score as they accumulate (10%)[6]

Since Players have different starting positions and levels of GDP, the aim is not to 'beat' all the other Players, but to end up in as good a situation as possible given your starting point and the choices of other Players.

[4]Narang, *Seeking the Bomb: Strategies of Nuclear Proliferation*, p. 18, 68–9.

[5]Zhang identifies the crucial steps as converting uranium hexafluoride gas into metallic form and then casting an machining the metal, along with designing the weapon and its neutron initiator, detonation wave focusing system, high explosives, detonators, and the arming, fusing, and firing system. Hui Zhang. *How quickly could Iran build its first nuclear weapon? Look at China.* 2025. URL: `https://thebulletin.org/2025/01/how-quickly-could-iran-build-its-first-nuclear-weapon-look-at-china/` (visited on 01/23/2025).

[6]TK — The exact number of tokens corresponding to each percentage score will need to be determined later as part of balancing action success probabilities to make *Rivals* playable.

### 1.5 Post-game debrief

*Rivals* is intended as an educational tool for helping Players learn about the dynamics of regional nuclear weapon proliferation. As participants in a prototype simulation, Players are encouraged to take part in a short feedback session after the game. In particular, this session should address any problems or ambiguities which arose during play. Players are also encouraged to provide further comments to the game designer when it is convenient for them to do so.

## 2 Player guide (review before play)

Welcome to *Rivals*, an interactive simulation designed to probe and illustrate the dynamics of regional nuclear weapon proliferation! As national leader, your choices will determine the course which your country follows. In combination with the choices of other Players, you will shape the future of your region.

### 2.1 Game mechanics and how to play

Players represent sovereign nations and are expected to behave diplomatically as leaders with the support of a foreign service. Players may be referred to as 'Ambassador Neon' or 'Ambassador Krypton' to underscore these expectations and norms.

**Player Scores and winning:** Each Player begins with a unique scenario, so the aim is not to 'win' in terms of overpowering all other Players, but simply to do as well as possible given your constraints. The game is not meant to be fun; it is a serious exploration of issues of the direst global significance, and a deliberate and experimental attempt to overcome the discomfort people have discussing nuclear weapons within appropriate and politically-oriented settings.

Everybody wins if further nuclear weapon proliferation is prevented, **but if not** you want to be in the group that progresses most.

**Player choices:** At the beginning of the game, each Player chooses a value (0–100) for Intelligence Service Competence. Intelligence Service Competence values are public to all Players and cannot be changed mid-game. In each Turn, this value affects the odds of a successful Military Coup. A more unified and competent security service is more likely to overthrow your government if they try. The value also affects the odds of success for all clandestine Actions, which are all those such as sabotaging another Player or stealing Expertise which the initiating player would not want publicly known. Remember: a higher value for Intelligence Service Competence will increase the odds of success for all clandestine actions, but it will also cause an increased risk of a Military Coup in every Turn.

**Action Points:** Each Player receives 1 Action Point (AP) per Turn for every $100 B in GDP. AP tokens are issued openly by the Ref at the beginning of each Turn, after the Ref provides their scenario update.

AP tokens should be flat an unobtrusive so they can be passed discreetly between players with a padded envelope.

AP may be kept behind the Privacy Screen in whole or in part at each Player's discretion. At any time, any Player may clandestinely exchange AP to any other Player or the Ref via a closed envelope. Players may distribute as many closed envelopes as they wish at any time to the Players and the Ref. If Players receive an empty envelope, they should not communicate this to other Players.[7]

Leftover AP at the end of the game has no Score value, so use it or lose it! (Hint: Check your Action Menu for ways to spend AP on improving domestic public sentiment or your global reputation.)

**Diplomacy:** Players may openly or privately enter into agreements with one another.

Some such choices are included in the Action Menu, including rules for calculating the success or failure of the effort. Only Actions from the Action Menu can affect the relationship score between Players; it cannot be changed voluntarily or by agreement between Players.

Any bespoke agreement between Players is allowable provided it does not contradict the rules of *Rivals*, as interpreted conclusively by the Ref. Bespoke agreements cannot affect the relationship scores between Players, but may be the basis for exchanging AP, sharing Expertise, and other in-game Actions. For example,

[7] This is to avoid the need for an excessive number of private meetings. If a Player really wishes to emphasize quiet diplomacy, they may opt to exchange padded envelopes with every Player in every Turn to obscure who, if anyone, they are really writing to.

one Player might offer to accept RC tokens from others along with AP tokens for payment; two Players might agree (privately or publicly) to work together to impede the weapon program of a third Player; Players might establish an agreement to share Expertise any time one gets more advanced than the other; or cooperating Players might offer each other compensatory AP if any of the group gets sanctioned by the World Nuclear Powers. Declarations may also be unilateral. For instance, Helium could offer to share a weapon design with its allies, in the event its opponents cross a particular threshold; or a Player could declare that they will spend the last five turns of the game improving diplomatic relations with whoever chooses to show the most RC tokens (probably indicating early development of fuel cycle capabilities, but potentially obtained from other Players).

No promise made by a Player — whether from the Action Menu or spoken verbally — is binding or restricts the Player from taking contrary Actions. For example, if one Player accepts a transfer of Radiological Contamination Tokens to display publicly to convey the sense of a well-developed weapon program, the Ref shall not enforce any clauses in the agreement, such an agreement to return the Tokens before the final Turn. All agreements between Players should be communicated to the Ref during a one-on-one session at the end of the Turn in which they are agreed, if not publicly announced in conference. This is because the Ref will not be able to properly manage the flow of play if Players have unknown secret agreements.

Players may communicate with one another and with the Ref at any time using their padded envelopes. These may be used to exchange private messages or proposals: flatter your friends, mock your enemies, and try to improve your Score.

**Colour from the Ref:** When giving the start-of-Turn update on the state of play, and when narrating the results of Player Actions at the end of each Turn, the Ref shall supply suitable interesting details and information. For example, if a Player successfully employs a sabotage Action against a Rival, the Ref may publicly describe a mysterious fire of explosion. Likewise, if a Player fails in an Action due to a low dice throw or low Intelligence Service Competence, the Ref shall supply a suitable narrative. Generally, the Ref will conduct themself similarly to the Secretary General of the United Nations: avoiding any suggestion of favouritism, and treating players as sovereign representatives of their state. The Ref may refer to Players collectively as "assembled Sovereign Representatives".

*Rivals* is still an experimental simulation and there are likely many places where the rules are ambiguous, hard to interpret, or hard to interpret in combination. The Ref's purpose is to make the simulation a valuable and educational experience for everyone. The Ref shall employ their over-riding power to interpret the rules in order to serve this purpose. If necessary, Players may agree by unanimous consent to amend the rules of the game in progress.

**Colour from Players:** Please remember that Helium, Neon, Argon, Krypton, and Xenon are fictional and simplified representations chosen to establish a plausible but politically non-specific gameplay style. Players represent states speaking as sovereigns, including with support from their diplomatic corps, so they will conduct themselves with suitable decorum and respect. Within the bounds of courtesy Players may elaborate on the details of their Actions and their reasoning if they so wish, or encourage other Players to act in certain ways, either publicly in conference or by note in a closed envelope.

**Staying in power:** At the beginning of each Turn, starting with the 2nd Turn, each Player faces a Ref-run simulation of both the risk of a Military Coup and a Popular Uprising.

The higher player-selected value for Intelligence Service Competence (0–100) influences the likelihood that the military will succeed in taking power if they try. Whether they try or not is an intractable question of human loyalty and ambition, and so is modeled probabilistically for each Turn.

A Player's Public Sentiment score at the end of the previous Turn influences the odds of a successful Popular Uprising. Being popular improves the odds of avoiding a Popular Uprising. Players can improve Public Sentiment through Action Menu items; actions by other Players will indirectly influence Public Sentiment, such as by causing a 'rally round the flag' effect if a sabotage or assassination campaign is uncovered.

If a Player's government is overthrown, they are issued no AP for the next Turn. In addition, two random Blocks from the Player's Completion Card shall be removed by the Ref to represent setbacks in the program.[8]

[8]The Ref shall accomplish this by numbering the Blocks in a Player's Completion Card starting in the top left corner, rolling a die with at least as many sides as there are completed Blocks, and eliminating the Blocks corresponding to the numbers of the first two valid die castings. (If the Ref rolls a number higher than the Player's last Block, the Ref shall roll again until two Blocks have been removed.

**Radiological Contamination:** During each Turn where a Player has at least Block of fuel cycle Equipment, they shall accumulate one Token of Radiological Contamination (RC) per Block. This includes the fuel cycle Blocks that Helium and Neon have in place at the start of the game. RC Tokens shall be privately distributed by the Ref as part of finishing each Turn. For each Block of Equipment or Expertise at the third (weaponization) level, the Player shall accumulate one Token of Radiological Contamination. Like AP tokens, these may be displayed by any Player or concealed with the Privacy Screen. Players may also exchange RC tokens, overtly or covertly, on terms that they agree to. A higher level of tokens of Radiological Contamination means a greater danger that a clandestine weapon program will be discovered by the World Nuclear Powers, and is also a small input to a player's Score.

**Program detection by the World Nuclear Powers:** Each Turn, each Player faces a probability that the World Nuclear Powers will discover their clandestine weapon program (if any). The probability is weighted with the number of Blocks the Player has completed beyond the scientific research level, the quality of their Intelligence Service (a better service protects your secrets more effectively), and number of RC Tokens they have accumulated.

**Sanctions:** If a Player's reputation with the World Nuclear Powers falls below -50, there will be a danger at the end of each Turn that they will impose sanctions which will decrease your GDP by 10%. This means 10% less AP will be issued in subsequent Turns. If your reputation falls to -100, sanctions of 10% of your starting GDP are automatically applied. If your reputation falls to -100 after you have already been sanctioned, the penalty rises to 20% of your starting GDP. Despite having a known weaponization program, Neon's GDP is treated as already sanctioned from the beginning of the game (the GDP in the player guide already takes into account sanctions prior to the start of the simulation), though the Player can be further sanctioned via the same mechanism as other Players.

**Helium's special role:** They have not Announced weapon capability or Tested, but are known by all Players and the World Nuclear Powers to be nuclear weapon capable. As such, they do not invest AP in progressing toward nuclear capability. Instead, they seek to counter regional proliferation through a combination of diplomacy and clandestine Actions. Helium may also Announce or Test, like all other players that have achieved weaponization. If Helium Announces or Tests, the *Status Quo* Win condition is no longer met and the Score is instead calculated on the basis of the regional balance of nuclear weapon capability as detailed elsewhere in these rules.

## 2.2 Your Completion Card — what it takes to build a nuclear weapon

In order to build a nuclear arsenal under your control, you will need Personnel, Raw Materials, Equipment, and Expertise. Players invest in each area of capability within three levels:

1. Blocks in the first tier can be justified as a scientific **research** program. There is no danger of opprobrium or sanctions from the World Nuclear Powers at this level.
2. Blocks in the second tier represent a **dual use** program of civilian nuclear energy wherein many requirements for a weapon program can be obtained by deploying intrinsically dual-use nuclear technologies.
3. Blocks in the third and final tier represent **weaponization**. If detected, Actions to obtain these Blocks carry a high risk of international detection and response. The final Block of Expertise is a nuclear weapon design, which is verified if the weapon was Tested or if the design was obtained from a friendly World Nuclear Power.

The World Nuclear Powers and global community are opposed to further weapon proliferation, so each new level of progress toward weapon capability carries greater diplomatic and economic risks.

Equipment Blocks come on two parallel tracks. First, there are all the capabilities necessary for a domestic nuclear energy industry in which ready-to-use fuel rods are imported and spent fuel is re-exported instead of processed. It is possible to possess the capability to operate nuclear reactors with no ability to enrich uranium for fuel or reprocess spent fuel. Second, there are capabilities necessary for a domestic nuclear fuel cycle. These include uranium enrichment and plutonium re-processing, and so are essential weapon technologies. Blocks of Fuel Cycle Equipment (as well as all Blocks at the weaponization level) produce RC tokens at the end of each Turn.

Once any Player has filled in all parts of their Completion Card, including the weaponization tier, they have the option at *any time* (not only during the part of each Turn where Players select Actions) to Declare

weapon capability or Test a weapon. A Player's decision to Test interrupts all ongoing action, including inter-player negotiations and updates from the Ref. A Player with the capacity to Test may raise their hand during any part of a Turn and announce their intention to perform an interrupting act. Only items from the "After weaponization" portion of the Action Menu can be triggered through interruption, and, after being recognized by the Ref, a Player interrupting may publicly Declare weapon possession or Test a weapon. If more than one Player tries to interrupt simultaneously, they shall state their chosen Actions in the order in which they are recognized by the Ref. If a Player conducts a Test during any Turn, no other Player can do so within the same Turn (it takes time to prepare a test site). Once the outcome of an interrupting action has been calculated, the game returns to whatever was in progress before the interruption (which could be an update from the Red, discussions in conference by the Players, one-on-one's between Players and the Ref, or during end-of-turn calculations by the Ref).

From when you start working with your first laboratory-scale samples of fissile materials right until you are deploying weapons of validated design on suitable delivery systems, you will require Personnel of growing specialization. Your Action Menu includes options for recruitment, and the direct and indirect actions of you and other Players will also influence your progress along this axis.

If you choose to pursue a weapon program, or maintain the option of one as a hedge under civilian cover, you will need Raw Materials ranging from ultra-pure graphite as a reactor moderator to reactor-grade metals and, of course, uranium. Your Action Menu includes options for developing, begging for, and stealing such materials.

Equipment is the most demanding factor for your potential nuclear weapon program. You need not only the means to produce or obtain reactor-grade uranium fuel to begin breeding plutonium, but also chemical reprocessing capability to refashion spent fuel rods into weapon-usable fissile materials. You need hot cells and robotics for all that — large secure sites in remote areas — mines and mills and smelters to supply your specialist requirements... You need also enrichment capability to make your own reactor-grade fuel. You will need twice as many Blocks of investment in this category to reach each capability level, as represented by having to fill two columns on your Completion Card.

Expertise must be cultivated in order to achieve each level of capability. At the weaponization level, expertise consists of either an indigenously developed bomb design or a verified design obtained from the World Nuclear Powers.[9] The unique factor with Expertise is portability. You can invest AP to select Actions which build expertise, but you can also freely share Blocks of expertise with your allies, overtly or covertly, if you so choose. Players may declare such cooperation as a Public Action or notify the Ref via a note in a sealed envelope as a Private Action. Expertise points can only be shared by a Player who has filled the Block which is to be shared in their Completion Card, and only at the level of those Blocks. Once shared, the Block is treated as complete on the Cards of both Players. If a subsequent game development causes one Player to have the Block eliminated, it is not eliminated for the recipient of the information sharing.

## 2.3 Starting conditions for Players

### 2.3.1 Meet the Players

**Helium:** (GDP: $500 B) A *sotto voce* nuclear power with a population of about 10 million. Confined to a comparatively small area and confronted by many hostile states in the region, Helium works to impede progress on nuclear weapons in enemy states. The economy is not resource dominated, but rather focused on the technology and service sectors. Helium begins with a full Completion Card and accumulates RC tokens from the first Turn.

**Neon:** (GDP: $500 B) A hated enemy of Helium, known to the world to be on the brink of weaponization. Neon begins the game with their Completion Card filled with a complete program at the dual-use level (full Reactor and Fuel Cycle Equipment) and will accumulate RC tokens from the first turn; they must invest Action Points if they wish to weaponize. With a population of 90 million and a large territory, it is considered an especially acute threat by Helium, and also embraces a contradictory ideology. Neon is a major hydrocarbon exporter.

[9] There is precedent for an existing nuclear power giving a bomb design to a potential proliferator, including China allegedly providing a uranium bomb design to Pakistan in 1976. Narang, *Seeking the Bomb: Strategies of Nuclear Proliferation*, p. 206, 213.

**Argon:** (GDP: $1 T) One of the world's largest hydrocarbon producers, with a population of 30 million, Argon has immense financial resources. Previously dependent on outside powers for security, Argon feels increasingly uncertain about the depth of their external allies' commitment and capability, as well as increasingly threatened by regional powers.

**Krypton:** (GDP: $1 T) An immensely rich small coastal state with very little habitable land, Krypton has a population of 10 million concentrated in a few large cities.

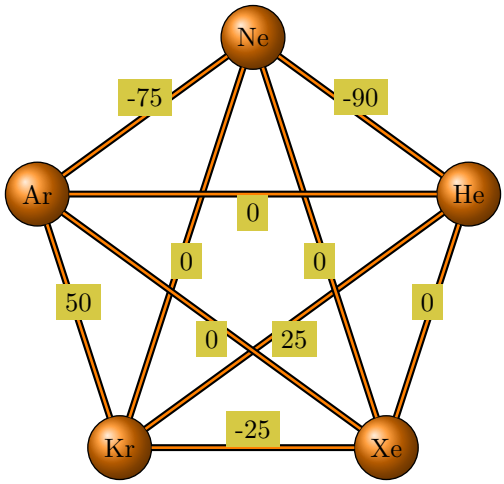
**Xenon:** (GDP: $1 T) Xenon is at the upper income level for a middle-income country and has been emerging economically, with a population of 90 million. Xenon occupies a large and strategic territory.

### 2.3.2 Diplomatic relations among Players

Every pairing of Players has a relationship level that can run between -100 (intense dislike, virtually at war) to +100 (a trusted long-term ally). Player Actions will affect these values:

(Xe)

| | He | Ne | Ar | Kr | Xe |
|---|---|---|---|---|---|
| He | | -90 | 0 | 25 | 0 |
| Ne | -90 | | -75 | 0 | 0 |
| Ar | 0 | -75 | | 50 | 0 |
| Kr | 25 | 0 | 50 | | -25 |
| Xe | 0 | 0 | 0 | -25 | |




Depending on the relationship level between any two Players, they are considered:

- Allies if $\geq 75$
- Friends if between 5 and 70
- Rivals if between -5 and -70
- Enemies if $\leq 75$

Some Actions are only available if the relationship between two Players has a certain value. For example, sharing Blocks of Expertise can only be done among those who are Friends or better. Some Actions have different probabilities and effects when directed at friends rather than enemies.

## 2.4 Starting Player reputations with the World Nuclear Powers

- He: 20
- Ne: -75
- Ar: 15
- Kr: 20
- Xe: 15

# 3 Completion Card

Players progress toward nuclear weapons capability by filling their Completion Cards Block by Block and level by level.

| Level | Personnel | Raw materials | Reactor Equipment | Fuel Cycle Equipment | Expertise | |
|---|---|---|---|---|---|---|
| 1 | | | | | | Can be justified as scientific research |
| 2 | | | | | | Can be justified as civilian nuclear energy |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 3 | | | | | | Weaponization |

# 4 Action menu

In the world of *Rivals*, your choices and those of your fellow Players will influence the factors which allow each of you to implement your strategies, and ultimately who is able to prosper best in your dangerous geopolitical neighbourhood. All Action Menu items are inspired by real historical actions performed by aspiring nuclear weapon states.

In the broadest sense, the parameters of the game suggest four possible strategies: work multilaterally to stop weapon development by anyone, race toward weapon development in parallel with your friends, focus on restraining weapon programs of enemies and bolstering domestic popularity, or working diplomatically to turn enemies into friends.

Personnel is the necessary pre-requisite for each stage of advancement. A Player may only take Actions to develop Raw Materials, Equipment, and Expertise at any given level after they have filled the Personnel Block for that level. If a Player loses a Personnel Block, they do not lose progress which has been completed at that level, but they must replace the Personnel block before making any further advances at that level or higher.

Every Action involves some luck and will involve you rolling a 20-sided die. Many Actions carry one or more negative consequences if failed. Depending on the Action chosen, a Player's dice roll will be modified by the Ref based on relevant inputs. For example, clandestine Actions are more likely to succeed with higher Intelligence Service Competence, and efforts to share expertise a friendly Player become more likely to succeed the better the relationship is between the two.

**Intel Assessments:** Your Intelligence Service experts have provided their best estimates of the likelihood of different outcomes for each of the policy options below. They are only human, however, and the true probabilities are accessible to the Ref only. There may also be unpredicted effects associated with any given Player Action. For example, a sabotage or assassination campaign against a rival state may boost domestic public sentiment as citizens focus on foreign enemies and 'rally around the flag.'

Each potential Action has its characteristics listed in the following format:

**Action name** (Action type)

- Description of the Action
- AP cost:
- Estimated odds of success
- Effect if successful
- Effect if unsuccessful
- Limits (for example, the relationship value between any two Players cannot change more than ±50 in an entire game)

Each Action is the responsibility of a government entity which it is in your power to direct as a Player.

## 4.1 Ministry of Industry, Science, and Technology

Your MIST will be chiefly responsible for the technical and logistical sides of any potential weapon development. Actions they offer will allow you to earn Blocks of Personnel, Raw Materials, Equipment, and Expertise.

#### 4.1.1 Personnel

**Recruit scientists and engineers for research program** (Develop)

- Recruit the personnel who can implement a nuclear research program
- AP cost: 1
- Estimated odds of success: 95%
- Fill level 1 personnel Block; Player can now take Actions to complete other level 1 Blocks
- Effect if unsuccessful
- Limits

**Recruit personnel for dual use stage** (Develop)

- Recruit personnel who can construct reactors, and potentially uranium enrichment and plutonium reprocessing plants as well
- AP cost: 1
- Estimated odds of success: 95
- Effect if successful
- Effect if unsuccessful
- Limits

**Recruit weaponization personnel** (Develop)

- Recruit people who can build the bomb
- AP cost: 2
- Estimated odds of success: 80%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.1.2 Raw materials

**Develop uranium mining and milling facilities** (Develop)

- Uranium is about 40 times more abundant than silver. Producing it in a form which can be used for reactors and weapons requires mines and milling facilities
- AP cost: 1
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.1.3 Expertise

**Overt basic research program** (Develop)

- Develop your nuclear capability to the level of an advanced scientific research program
- AP cost: 1
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

**Clandestine basic research program** (Develop)

- Develop your nuclear capability to the level of an advanced scientific research program
- AP cost: 1
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.1.4 Equipment

**Build reactors** (Develop)

- Developing reactor capabilities can be justified in several ways, including economic diversification and concern about climate change
- AP cost: 2
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

**Build enrichment plants and reprocessing facilities** (Develop)

- Producing fissile materials for weapons requires either plants to enrich uranium to weapons-grade or facilities to reprocess plutonium from spent fuel rods
- AP cost: 2
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

**Produce weapons-grade fissile material** (Develop)

- Uranium can be spun to weapons-grade in centrifuges; making plutonium for a weapon core requires breeding the element in a reactor and then separating it chemically through reprocessing
- AP cost: 2
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

### 4.2 Foreign Ministry

Diplomacy will allow you to influence your relations with other Players and the World Nuclear Powers.
**Academic exchange program** (Diplomacy)

- Interchange between your scholars and those of another Player will help establish or strengthen a positive relationship between two Players
- AP cost: 1 per player
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits: May only be used one per pair of Players per Turn

**Cultural exchange program** (Diplomacy)

- Hosting an exchange for artists, writers, and other cultural figures will help establish or strengthen a positive relationship between two Players
- AP cost: 1 per player
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits: May only be used one per pair of Players per Turn

**Athletic exchange program** (Diplomacy)

- Sporting matches and athletic contests will help establish or strengthen a positive relationship between two Players

- AP cost: 1 per player
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits: May only be used one per pair of Players per Turn

**Pact not to develop fuel cycle Equipment** (Diplomacy)

- Two or more Players may pledge to one another that they will not develop Blocks of fuel cycle equipment
- AP cost: 0
- Estimated odds of success: 100%
- Effect if successful
- Effect if unsuccessful: Cannot be failed
- Limits

**Pact not to weaponize** (Diplomacy)

- Two or more Players may pledge to one another that they will not develop Blocks at the weaponization level
- AP cost: 0
- Estimated odds of success: 100%
- Effect if successful
- Effect if unsuccessful: Cannot be failed
- Limits

**International do-gooding** (Diplomacy)

- Players may improve their relationship value with the World Nuclear Powers by providing foreign aid, deploying peacekeepers and other assistance to catastrophes, and by contributing to the good work of international institutions.
- AP cost: 1
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

**Provide perks to the World Nuclear Powers** (Diplomacy)

- Two or more Players may pledge to one another that they will not develop Blocks at the weaponization level
- AP cost: 1
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.2.1 Raw materials

**Import reactor fuel** (Develop)

- The world's uranium producers will happily provide fuel assemblies for your reactors, at a cost
- AP cost: 1
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.2.2 Expertise

**Share level 1 (research) expertise with an ally** (Diplomacy)

- Share your knowledge of basic nuclear science and engineering with an ally
- AP cost: 1 per player
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

**Share level 2 (dual use) expertise with an ally** (Diplomacy)

- Share your knowledge of reactors and the fuel cycle with an ally
- AP cost: 1 per player
- Estimated odds of success: 95%
- Effect if successful
- Effect if unsuccessful
- Limits

**Share level 3 (weaponization) expertise with an ally** (Diplomacy)

- Share weaponization expertise with an ally — if the player providing the expertise has a verified design, the recipient will be considered to have a verified design as well
- AP cost: 1
- Estimated odds of success: 80%
- Effect if successful
- Effect if unsuccessful
- Limits

**Procure assistance with dual-use technology from foreign firms** (Diplomacy)

- The nuclear industry in every country is always in search of new customers, and their host governments welcome the jobs and export earnings. With enough money on offer, enrichment and reprocessing technologies are also available
- AP cost: 1
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

### 4.3 Intelligence Services

Your Intelligence Services can act domestically and abroad for you: protecting your secrets, stealing those of others, and taking direct actions.

**Counterintelligence and security program** (Inhibit)

- By investing in security, you reduce the odds of other Players stealing from your or sabotaging your program.
- AP cost: 1
- Estimated odds of success: 100%
- Effect if successful
- Effect if unsuccessful: Cannot be failed (but that doesn't mean complete protection against malign foreign efforts)
- Limits

#### 4.3.1 Personnel

**Assassinate personnel** (Inhibit)

- Every human is mortal, and your agents can accelerate that reality for other Players' personnel through overt or covert shootings, bombings, poisonings, or 'accidents'
- AP cost: 1
- Estimated odds of success: 75%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.3.2 Equipment

**Sabotage raw materials** (Inhibit)

- Each Player's nuclear industry depends on procuring highly specialized and exotic materials. By sneakily making sure they get the wrong steel for a reactor, the wrong carbon fibre for a centrifuge rotor, the wrong material for irradiation targets, etc, you can confuse and slow their progress
- AP cost: 1
- Estimated odds of success: 50%
- Effect if successful
- Effect if unsuccessful
- Limits

**Sabotage equipment** (Inhibit)

- Facilities and equipment can be targeted overtly or covertly — possible tactics range from blowing up foreign-provided parts before delivery to using cyberattacks to make another Player's equipment ineffective
- AP cost: 1
- Estimated odds of success: 50%
- Effect if successful
- Effect if unsuccessful
- Limits

#### 4.3.3 Expertise

**Steal expertise from an enemy** (Develop)

- In the course of investigating your rivals' nuclear programs, your spies may be able to bring back some information which will be helpful for your own development process
- AP cost: 1
- Estimated odds of success: 50%
- Effect if successful: Gain one Block of expertise
- Effect if unsuccessful
- Limits

**Steal expertise from a friend or ally** (Develop)

- Stealing expertise from a friendly Player is easier, but carries a heavier cost if detected
- AP cost: 1
- Estimated odds of success: 75%
- Effect if successful: Gain one Block of expertise
- Effect if unsuccessful
- Limits

**Beg the friendliest World Nuclear Power for a verified weapon design** (Develop)

- Despite their erstwhile commitment to non-proliferation, geopolitics and economics may make the most sympathetic World Nuclear Power willing to hand over a verified design
- AP cost: 1
- Estimated odds of success: 40%
- Effect if successful
- Effect if unsuccessful
- Limits

## 4.4 Lonely folks in a city that isn't on the map

You can choose whatever Secret Squirrel name for them you like, but the fact is that if you actually want to develop a nuclear weapon, someone is going to have to develop the most directly-applicable expertise, engineering, and fabrication ability. Somebody has to *build* the things, and as far away as possible from where any enemies might detect them doing it.

### 4.4.1 Expertise

**Develop weapon design** (Develop)

- Using whatever information they can gain access to, your scientists and engineers will make their best effort to indigenously design a functional weapon
- AP cost: 2
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

### 4.4.2 Equipment

**Machine weapon cores** (Develop)

- Functional weapon cores require precisely machined components and a suitable neutron initiator
- AP cost: 2
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

**Build high explosive lenses** (Develop)

- High explosive lenses provide the indispensable compression required to make a plutonium weapon core supercritical
- AP cost: 2
- Estimated odds of success: 90%
- Effect if successful
- Effect if unsuccessful
- Limits

## 4.5 Interior Ministry and Ministry of Health and Welfare

A happy, healthy population is less likely to overthrow you, and domestic popularity is one component in a Player's Score.

**Perks for the security services** (Domestic politics)

- Improving pay and benefits for rank-and-file police, military, and intelligence figures — as well as larger perks for those at the top — ties these figures more closely to your leadership and decreases the odds they will choose to overthrow you.

- AP cost: 1
- Estimated odds of success: 100%
- Effect if successful
- Effect if unsuccessful: Cannot be failed
- Limits

**Raise quality of life for the general population** (Domestic politics)

- Sometimes the best defence against losing power through a Popular Uprising is spending on people who can in no way advance your nuclear program
- AP cost: 1
- Estimated odds of success: 100%
- Effect if successful
- Effect if unsuccessful: Cannot be failed
- Limits

### 4.6 After weaponization

Any Players that has filled their Completion Card entirely may choose to remain an undeclared threshold power, or may choose to Announce or Test. Only Players with a full card can Announce or Test, and remember that only one player may Test in any Turn. These actions interrupt all other game activity: a player with the requisite capabilities may raise their hand and be recognized the the Ref in order to Declare or Test at any part of any Turn.

**Announce weapon capability**

- Declaring yourself a nuclear power impacts the Player's Score, may encourage potential friends to improve relations, and may prompt rivals to redouble their efforts
- AP cost: 0
- Estimated odds of success: 100%
- Effect if successful: The Player's weaponization level, for the purpose of Scoring, rises to 90% (or 95% if they have obtained a verified design)
- Effect if unsuccessful: Cannot be unsuccessful
- Limits: Can only be done by a player with a full Completion Card, including the weaponization tier

**Test a weapon**

- Nothing creates certainty that a state possesses nuclear weapons like testing one. Everyone will know immediately about an overt test, and a clandestine test is at least highly likely to be detected by the World Nuclear Powers
- AP cost: 1
- Estimated odds of success: 100% with a verified design, 90% with an indigenous design
- Effect if successful
- Effect if unsuccessful
- Limits: Only one Player may Test per Turn.

## 5 Guide for Referees

I must confess that I got hundreds of days into the development of Rivals before I realized the rule book needed a section addressing people who intend to Ref a runthrough of the simulation. I always expected to do the prototype run-throughs myself, and use the lessons from that to write follow on documets, but the content will be essential for the implementation of the game in other settings and it is only fair for interested players or anyone taking an interest in the sim to get this information too.

### 5.1 Emotion in *Rivals*

To begin with, let me commend you for taking on a difficult and challenging, but important, task. The subjects of security competition, nuclear arms proliferation, and some of the violent mechanisms used in reality are all provocative, stressful, and emotional. Rivals is meant to be an educational tool, not a fun game, but at the same time the emotional tone needs to be regulated to make it an instructive activity rather than a cause of frustration or hostility.

If necessary, the Ref may intervene to preserve a respectful tone in gameplay. This may include publicly urging Players to remain in their roles as diplomatic ambassadors, calling private conferences with one or more Players to advise and council them, calling for pauses in the game, or taking other similar actions.

### 5.2 Rule interpretation and judgment calls

*Rivals* is still a prototype and there is no way the designer can anticipate every interaction between the rules as written and how Players will choose to act. When necessary, it is up to the Referee to adjudicate between rules and address anomalies as they arise. I recommend the following principles for this process:

- Open process — To the greatest extent possible, the evidence and reasoning behind rule interpretations should be shared with the Players. This will help make the game a collaborative teaching exercise, even though the Players can be in competition. The only thing to be cautious about is keeping Players' secrets. It may be necessary to interpret or explain rules without a full explanation, when one of the factors is information held only by the Ref or a subset of Players.
- No favouritism — When it is necessary to interpret a rule, the Ref shall do so with the intent of maintaining the purpose and integrity of the game, and will avoid making choices which seem to unduly favour any Player.
- Amend voluntarily if possible — The Players can agree by unanimous consent to amend the rules of the game in progress. If possible, this is preferable to the Ref imposing a rule change, though the Ref may do so if they judge it best.

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