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POWER GRID

 **ENERGY CRISIS**

A full Expansion Deck by Noah V

Goal

After getting the New Power Plants Expansion Deck, I was disappointed to see how little the game was expanded. Browsing the forums and through developments of my own, I felt that we could do better and truly expand the game.

The Energy Crisis Expansion utilizes a complete new deck and rules which modify the behavior of the old deck. Each power-plant operates slightly differently. This is designed to both simulate how the plant works in “real life” and to make game decisions more exciting and interesting. Overall, the goal of Energy Crisis is to keep the game dynamic and prevent “analysis paralysis” by introducing new variables and decisions that cannot be as readily predicted and at the same time, not introducing a large luck factor.

Also note, I am not a graphics artist (all pictures were modified in MS Paint from Google Images) so please feel free to contribute any alternative artwork if you are so inclined.

Special Thanks to:

Chris Jones: Fast Breeder Reactor (42): <http://www.boardgamegeek.com/image/400302/power-grid>

Interactivities Ink: Idea & Art for 4th Plant, Idea of Hydro Plant, Auxiliary & Solar Power (07, 12, 14, 15, 24, 36, 45) <http://www.interactivitiesink.com/cardgames/index.html>

Requirements

- **Power Grid game** (you may include expansions)
- **Knowledge of the rules**
- **Multiple 6-sided Dice** (at least 2)
- **Scissors/Paper Cutter/Cardboard/Sticker Paper** (to print and cut the Expansion deck)

Contents

- **Energy Crisis Deck:** A complete 42 card deck to expand and supplement your current deck(s)
 - 6 **New Plant** types (4 each); 6 **Special Cards**; 12 **Event** cards
- **Energy Crisis Rules:** Detailed rules with examples and reasoning to use your new expansion deck
- **Color Summary Sheet:** Single page printout to summarize this manual



Rules for Using the Energy Crisis deck

Deck Preparation

Lay out the **Actual Market** and **Future Market** cards as normal, separating the 9th **Power Plant** and **Step 3 Card** from the remaining deck. Remove cards from the **Standard Deck** and shuffle in random **Energy Crisis** cards as per the table. Use this new combined deck for your game.

Players	Remove (From Standard Deck)	Add (From Energy Crisis)	Star Cards (From Energy Crisis)	Bills & Ideas (From Energy Crisis)
2	12	4	NO	NO
3	14	6	YES	NO
4	14	8	YES	YES
5	10	10	YES	YES
6	10	12	YES	YES

Reasoning: This table tries to keep the game at a similar length while keeping a good balance. Energy Crisis Cards are designed to complement rather than replace the Standard Deck. You **may add more cards** if you wish to have a longer but more unpredictable game.

Important: For a **2 player** game remove the **Star Cards** as well as the **Bills & Ideas** from your **Energy Crisis Deck** before adding your 4 random **Energy Crisis** cards to the **Standard Deck**. For a **3 player** game remove only the **Bills & Ideas** from your **Energy Crisis Deck** before adding your 6 random **Energy Crisis** cards to the **Standard Deck**.

Reasoning: **Star Cards** and **Bills & Ideas** tend to unbalance smaller games where a small change in the restocking values of a single resource can make a very big difference.

When an **Energy Crisis** card is drawn from the deck during play, place it in the **Futures Market** or **Actual Market** as appropriate for the **Card Number**. An **Energy Crisis** card is considered **higher** than the equivalent **Standard Deck** card when determining power plant order or player rank.

Resource Restocking

Use the **Restock** amounts for **1 Less Player** than currently playing.

Example: **4 players** are playing on the **USA/Germany Board**. During Phase 5, restock as if it were a 3 player game. For example, in **Step 2** restock **4 coal, 2 oil, 1 garbage, 1 uranium**.

Important: For a **2 player** game, restock as normal for **2 players**.

Reasoning: Most **Energy Crisis** Cards do not consume resources and some produce resources. This rule prevents the resultant resource surpluses. The expansion is called *Energy Crisis* after all. However, if you find this makes your game too tight and therefore not fun, you may drop this rule. This has been the most controversial rule in playtests with strong advocates on both sides.

Important: Some combinations of **Energy Crisis** cards may result in a **negative restock** value. If this occurs, **remove no more than one** of that resource from the **resource market** during **Phase 5**.



Rules for the Standard Power Plants in Energy Crisis

Coal Power Plants



After a player purchases a **Coal Power Plant**, place a spare **house** on the Power Plant **Card** as a marker. The **first time** the **Coal Power Plant** card is used to supply Electricity, it **requires 1 more coal** than stated on the card. **Remove** the house along with the extra coal **after using** the power plant. In all subsequent turns the **Coal Power Plant** operates as **normal**, requiring the normal amount of coal.

Example: Player A buys **04** (2 Coal = 1). He places a **house** on the card. When he first uses his **Coal Power Plant** to supply electricity to his network (in **Phase 5** of that turn, or in a later turn), he uses **3 coal** to power **1 city**. He **removes 3 coal** from the card along with the **house** placed on the card. In subsequent turns, he requires the usual **2 coal** to supply **1 city** when using power plant **04**.

Reasoning: Reflects the energy wasted heating the boiler coupled with the inability to finely adjust the output of coal power plants (when compared to some other modalities).

Oil Power Plants



An **Oil Power Plant** may operate at half capacity. On any given turn, a player may choose to **supply half** the amount of electricity (rounded down) by **using half** the required **oil** (rounded up).

Remember: An **Oil Power Plant** which uses only 1 **oil** (e.g. **09, 35**) or supplies **1 city** (e.g. **03, 09**) is unable to run at half capacity due to rounding.

Example: Player A buys **26** (2 Oil = 5). His other power plants are able to supply 8 cities and he has 11 cities in his network. In addition to using his other power plants, he chooses to use only **1 oil** to **supply 2 cities** (for a total of 10 cities). On a later turn, when his network has expanded to 14 cities, he uses **2 oil** to **supply 5 cities** (for a total of 13 cities).

Reasoning: The amount of power output in an oil power plant is closely related to the amount of oil supplied. This can generally be adjusted as supply and demand fluctuate.

Hybrid Power Plants



A **Hybrid Power Plant** works as stated in the original rules. The owner may choose to use any combination of **coal and/or oil** to power the number of cities stated on the card.

Important: A Hybrid Power Plant does *not* operate as both a **Coal Power Plant** (requiring 1 extra coal to run the first time) and/or an **Oil Power Plant** (able to run at half capacity).

Example: Player A buys **12** (2 Hybrid = 2). He may use **2 coal**, or **2 oil**, or **1 oil and 1 coal** to **supply 2 cities**. He *may not* use **1 oil** to **supply 1 city**. He *does not* need to use **3 coal** (or **2 coal and 1 oil**) to **supply 2 cities** the first time it is used.

Reasoning: The flexibility to burn multiple fuels limits the specialization of the plants.



Wind Power Plants



When a player wishes to use a **Wind Power Plant** to supply electricity to his network, he must roll a pair of dice. The wind power plant supplies the lesser of the total pips or the Power Plant's Supply value.

Important: When adding pips, a »6« counts as "0" (see table for examples).

Important: If a player rolls two »5«'s the **Power Plant** supplies 1 more city than stated (see table).

Supplies:	1 City	2 Cities	3 Cities	4 Cities	5 Cities
Unless a Roll of:	Original 13 New 10, 11	Original 18, 22 New 15, 16	Original 27 New 26	Original 33, 37 New 32	Original 44 New 39
1 & 1			2	2	2
1 & 2				3	3
1 & 3					4
2 & 2					4
1 & 6		1	1	1	1
2 & 6			2	2	2
3 & 6				3	3
4 & 6					4
6 & 6	0	0	0	0	0
5 & 5	2	3	4	5	6

Important: During the Final Game Ending Step 5, do *not* roll; Wind Power Plants supply as stated.

Important: If a player has more than one **Wind Power Plant**, roll separately for each power plant.

Reasoning: Wind power may be environmentally friendly, but the wind can be unreliable.

Fusion Power Plants



A **Fusion Power Plant** works as stated in the original rules. It **does not require any** resources and supplies up to the number of cities shown on the card.

Reasoning: Cheap, reliable energy is the dream of fusion power.

Garbage Power Plants



A **Garbage Power Plant** works as stated in the original rules. It **requires exactly** the stated amount of garbage to supply up to the number of cities shown on the card.

Reasoning: Garbage is a reliable energy source provided you have fuel to burn. Also, one plant type had to be "normal."



Nuclear Power Plants



After a player purchases a **Nuclear Power Plant**, place a spare **house** on the Power Plant **Card** as a marker. The **first time** the **Nuclear Power Plant** card is used to supply Electricity, it **supplies 1 less city** than stated on the card. **Remove** the **house** along with the **uranium after using**. In all subsequent turns the **Nuclear Power Plant** operates as **normal**, supplying the normal amount of cities.

Example: Player A buys **23** (1 Uranium = 3). He places a **house** on the card. When he first uses his **Nuclear Power Plant** to supply electricity to his network (in **Phase 5** of that turn, or in a later turn), he uses **1 uranium** to power **2 cities**. He **removes** the **uranium** from the card along with the **house** place on the card. In subsequent turns, he requires the usual **1 uranium** to supply **3 cities** with **23**.

Reasoning: Reflects the need to slowly power up a nuclear reactor to avoid a meltdown.

Flux Generator (33 $\frac{1}{3}$): Uses **any combination** of **3 resources** to **supply 6 cities**.

This Power Plant **supplies only 5 cities** the **first time** it is used like all other **Nuclear Power Plants**.

Fast Breed Reactor (42): Uses **2 uranium** to **supply 6 cities** and returns **1 uranium** to the **resource market track**. This Power Plant **supplies only 5 cities** the **first time** it is used.

Rules for The New Power Plants in Energy Crisis

Geothermal Power Plants



A **Geothermal Power Plant** **does not require any** resources and supplies up to the number of cities shown on the card. However, **while owned**, the player must **pay** the stated number of **Elektro** on the card **every turn** at the **beginning of** that player's turn in **Phase 3** or **forfeit the card**.

Example: Player A buys **25** (4 Geothermal = 3). **That Phase 3**, and in all subsequent turns in **Phase 3**, as long as the card is in the player's possession, he must pay **4 Elektro**. A few turns later, while strapped for cash, **Player A** sees he would need the **4 Elektro** to buy a city; he **forfeits** the power plant **instead** of paying the **4 Elektro**.

Reasoning: Sulphur and other corrosives make geothermal a high maintenance venture.

Natural Gas Power Plants



A **Natural Gas Power Plant** **does not require or consume any** resources, rather, in **Phase 5**, if a player chooses to use the power plant to supply his network, he pays the current price of **oil** for each **natural gas** required to run the power plant. Players **do not** have to **pay before collecting** Elektro. For every **Natural Gas Power Plant** owned in the game, restock **1 less oil** during the end of **Phase 5**.

Example: In a **5 player** game in **Step 2**, **Player A** buys **21** (2 Natural Gas = 3). In Phase 3, he buys resources for other power plants as normal, but does not need to buy anything for **21**. After **Phase 3**, **Oil** is filled to **6** on the resource track. In **Phase 5**, he uses his power plant to supply **3 cities** (in addition he supplies 7 more cities with other power plants). He collects **105 Elektro** but must return **18 Elektro** for the **Natural Gas**, netting **87 Elektro**. Since **Player B** also owns a **Natural Gas Power Plant** only **2 oil** is restocked this turn.

Reasoning: An oil byproduct, natural gas is difficult to store and can have an unstable price.



Biofuel Power Plants



A **Biofuel Power Plant** does not require or consume any resources, rather, in **Phase 5**, if a player chooses to use the power plant to supply his network, he pays the current price of **garbage** for each **biofuel** required to run the power plant. Players **do not** have to **pay before collecting** Elektro. For every **Biofuel Gas Power Plant** owned in the game, restock **1 less garbage** during the end of **Phase 5**.

Important: As with **Natural Gas Power Plants** (see above), if the **garbage market** (oil market in the case of **natural gas**) is **depleted**, you **cannot run** this power plant

Reasoning: Organics are separated from garbage during processing but have a limited shelf life.

Hydroelectric Power Plants



A **Hydroelectric Power Plant** does not require any resources and supplies up to the number of cities shown on the card. However, to supply cities, the player must have a **river city**.

Players may decide on river cities using house rules or use the table for examples. A **separate** river city is required for each **Hydroelectric Power Plant** an individual player owns.

Map	Cities
USA	Seattle, Buffalo, Portland, Las Vegas
Germany	Konstanz, Passau, Wilhelmshaven, Dresden
Benelux	Luxembourg, Liege, Middleburg, Namur
Europe	Wroclaw, Warszawa, Salzburg, Trnava
Brazil	Ionora, Maraba, Portowelho, Sau Paulo
Spain	Salamanca, Barcelona, Caceres, Porto
China	Guiyang, Zhengzhou, Taiyuan, Nanjing
Korea	Chuncheon, Seoul, Busan, Jeju

Reasoning: Hydroelectric is clean, reliable energy, provided you have somewhere to build the dam.

Star Cards:

Some cards have a **Star** in the top right corner. These cards can be used as a **fourth power plant**. They are auctioned for and purchased the same way as other power plants, and a purchase counts as a player's auction turn.

Important: **Star Cards** are **not** automatically **discarded** when a player's city total exceeds the card number **until Phase 5**.

Remember: 2 **Player** games **remove** the **Star Cards** from the deck.



Solar Power Plants



A **Solar Power Plant** does not require any resources and supplies up to the number of cities shown on the card. As a **Star Card** it can be used as a **4th Power Plant**.

Reasoning: While expensive, solar panels provide clean power on otherwise unused land

Auxiliary



Warehouse (07): Allows **one** power plant to store **triple** resources instead of **double**.

Coal Mine (12): At the **end of phase 5**, after all other restocking, generates **1 coal**. Stores **2 coal**.

Oil Derrick (14): At the **end of phase 5**, generates **1 oil**. Stores **2 oil**.

Recycling Plant (17): At the **end of phase 5**, generates **1 garbage**. Stores **2 garbage**.



Reservoirs



Excess power produced by **other power plants** may be **transferred** to the **reservoir** by placing a **house** on the card **for each unit** of power produced above the number of the cities supplied.

In **future turns**, **houses** are **consumed** (like other resources) to **supply electricity** to a player's network.

Example: Player A buys **13** (2 Reservoir = 3) and 3 additional power plants for a **total** potential output of **10 cities**. However, the Player only has **7 cities** in his **network**. In **Phase 5** he uses all 3 power plants, **supplying 7 cities** and places **3 houses** on the **reservoir**. In a subsequent turn, when his power plants can supply **11 cities** but he has **13 cities** in his **network**, he uses all 3 power plants and his **reservoir** to **supply** all **13 cities**, **removing 2 houses** and leaving **1 house** on the card.

Reasoning: Excess power can be stored as water pressure to be used later.

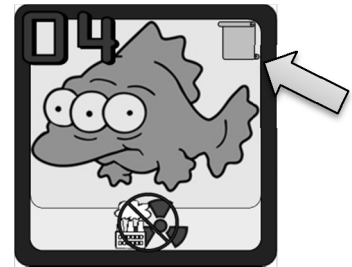
Note: I am aware these cards violate the 1st law of thermodynamics. It is for balance reasons.

Bills



Cards with **red numbers** and a **Scroll** in the top right corner are "**Bills**" that are **enacted as soon as** the card **enters** the **Actual Market**. When the **Bill** enters the **Actual Market**, remove it from the **Actual Market** and place it at the **top of the board**. Draw a new replacement card from the deck.

During **Phase 2** on a player's auction turn, he may choose to **cancel a bill** by **bidding** on it. Other players may **counter-bid** to keep the bill alive. If the bill is **cancelled**, it is **discarded** from the game and the effects no longer hold. If the bill is counter-bid to be **kept alive**, place a **house** on the card. The effects of the bill are **permanent** for the rest of the game.



If the bill is **cancelled**, it is **discarded** from the game and the effects no longer hold. If the bill is counter-bid to be **kept alive**, place a **house** on the card. The effects of the bill are **permanent** for the rest of the game.

Important: **Winning** a bid or counter-bid on a bill **does not count** as a player's auction turn. However, players may **initiate** bids to only to **cancel** a bill, and only on **their** auction turn.

Important: **Bills** are **not** automatically **discarded** when a player's city total exceeds the card number. They **must be bid on to be discarded**. As with all cards, if the **Bill** is the **highest** numbered card in the **futures market** in **Phase 5**, it is moved to the **bottom** of the deck for use in **Step 3**.

Remember: **2 & 3 Player** games **remove** the **Bill Cards** from the deck.

Example: **Bill 20** (Clean Air Act) is drawn during **Phase 5** and placed in the **Futures Market**. Two turns later, in **Phase 2**, **Player A** purchases, **20** (3 coal = 5), moving **Bill 20** into the **Actual Market**. **Bill 20** is immediately moved to the top of the board and another card takes its place in the **Actual Market**.

That turn, in **Phase 5**, when **Player A** uses **power plant 20**, he must pay **3 Elektro** in accordance with the bill.

Not happy and heavily invested in coal, the next **Phase 2**, **Player A** bids **20 Elektro** to **cancel** the bill. **Player B**, who has no coal power plants, and 2 nuclear power plants, **counterbids 25 Elektro**, and **Player A withdraws**. A **house** is placed on the bill, **blocking further attempts** to cancel.

Reasoning: Reflects the politics and backroom dealings that underscore the energy business.



No Nukes Campaign (04): Nuclear and Fusion Power Plants are **unavailable** for purchase and are **immediately discarded** as soon as they enter the **actual market**.

Carbon Tax (08): In **Phase 5**, when using a power plant to supply cities, players **deduct 1 Elektro** for each **coal** consumed, **2 Elektro** for each **oil** consumed and **earn extra 1 Elektro** for each **uranium** consumed. See above for a similar example with the Clean Air Act.

Energy Independence (10): In **Phase 5**, **restock 2 less oil**. All **supplied** cities earn **1 extra Elektro**.

Green Lobby (11): In **Phase 5**, **restock 1 less Garbage**. All **cities supplied** by power plants that are **not based on resources** (Fusion, Wind, Solar, Hydroelectric, Geothermal) earn **1 extra Elektro**.

Clean Air Act (20): In **Phase 5**, when using a power plant to supply cities, players **deduct 1 Elektro** for each **coal** consumed, **3 Elektro** for each **garbage** consumed and **earn extra 1 Elektro** for each **uranium** consumed. See above for an example.

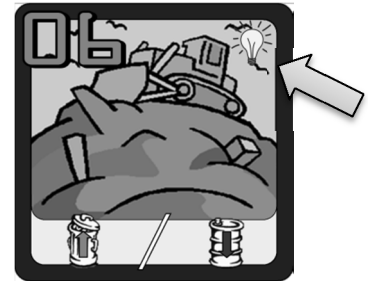
Dumping Regulations (26): In **Phase 5**, when using a power plant to supply cities, players **deduct 2 Elektro** for each **oil** consumed, **4 Elektro** for each **uranium** consumed and **earn extra 1 Elektro** for each **garbage** consumed. See above for an example.

Ideas



Cards with **Green Numbers** and a **Lightbulb** in the top right corner are “ideas” that are available to be **developed as soon as** the card enters the **Actual Market**.

During **Phase 2** on a player’s auction turn, he may choose to **develop an idea** by **bidding** on it. Other players may **counter-bid** to keep the **bury the technology**. If the **idea is developed**, it is removed from the **actual market** and placed at the top of the board. The idea’s effects remain for the rest of the game. If the **idea is buried**, move the card to the discard pile.



Important: **Winning** a bid or counter-bid on an idea **does not count** as a player’s auction turn. However, players may **initiate** bids only to **develop** an idea, and only on **their** auction turn.

Important: **Idea Cards** are **not** automatically **discarded** when a player’s city total exceeds the card number **until Phase 5**. As with all cards, if the **Idea** is the **highest** numbered card in the **futures market** in **Phase 5**, it is moved to the **bottom** of the deck for use in **Step 3**.

Remember: **2 & 3 Player** games **remove** the **Idea Cards** from the deck.

Example: **Idea 38** (Cracked Coal) is drawn during **Phase 5** and placed in the **Futures Market**.

Three turns later, the idea enters the **Actual Market** and is available to be bid on.

Player A, noting low coal prices and owning 2 oil power plants, bids **38 Elektro** to develop the idea.

Player B, who currently is the only consumer of coal, wants to keep her monopoly and counterbids **40 Elektro**. **Player A**, not to be dismayed, bids **45 Elektro**, and **Player B withdraws**.

For the rest of the game, all oil plants are treated as hybrid plants (see card description).

Reasoning: Some great ideas never get developed without the right people to grease the wheels.



Landfill Salvage (06): Restock 1 more garbage but 1 less oil.

Improved Enrichment (29): Restock 1 more uranium but 1 less coal.

Venture Capitalism (32): The actual market now has 5 cards while the futures market has 3. In Step 3, the market now holds up to 8 cards.

High Temperature Superconductors (32): All future connection fees are halved (rounded down). Each player deducts 2 Elektro from his earnings for each city supplied.

Cracked Coal (38): All Oil Power Plants are now considered Hybrid Power Plants.
Note: They can no longer run at half capacity, even if using only oil.

Energy Futures (40): Players enter the energy market by placing a house on the card. In Phase 5, they collect 5 Elektro for each city their power plants could supply regardless of network size. The following turn, in Phase 5, the player must deduct 6 Elektro for each city in his network and removes the house from the card. If unable to pay, he Cash-in power plants for 10 Elektro each. A player may re-enter the market that turn using the same procedure.

Example: Player A enters the Energy Market by placing a house on the card. He currently owns 15 (Solar = 1), 17 (1 uranium = 2), 21 (2 gas = 3), 30 (5 Geothermal = 4) and 9 cities in his network. Oil is 4 Elektro.

In addition to the 86 Elektro for supplying his 9 cities (98 - 5 for geothermal - 2x4 for gas), he earns 50 Elektro for entering the Energy Market (5x10) for a total of 136 Elektro.

The following turn, spending all his Elektro, his network has expanded to 13 cities and his Capacity to 13 (exchanging 17 for 28 (2 gas = 5)) however Oil has been depleted. Able to supply only 5 cities, he earns 59 Elektro (64 - 5) but must pay 78 Elektro (6x13). Unable to cover his debts (19 Elektro), he can choose to either:

- Collect 1 Elektro that turn but have to forfeit 2 of his power plants.
- Re-enter the market, earning 46 Elektro that turn (59 for cities - 78 debt + 5x13 from market) but potentially being even worse off the next turn if he keeps expanding.

Important: A player cannot end the game in debt. If the game ends while a player(s) is in the Energy market, get earnings and losses, forfeiting power plants as needed before calculating score.

Reasoning: This high risk, high reward game is what got Enron into trouble.



Graphical Overview of Rules

COAL 1st Use **+1**

OIL May use $\frac{1}{2}$ $\frac{1}{2}$



HYBRID Standard Rules Only (/)

WIND **+1** = 0

FUSION Standard Rules ()

GARBAGE Standard Rules ()

(33 $\frac{1}{3}$)

NUCLEAR 1st Use **-1**

(42)

GEO THERMAL / Per turn owned

NATURAL GAS (=) /

BIOFUEL (=) /

SOLAR /

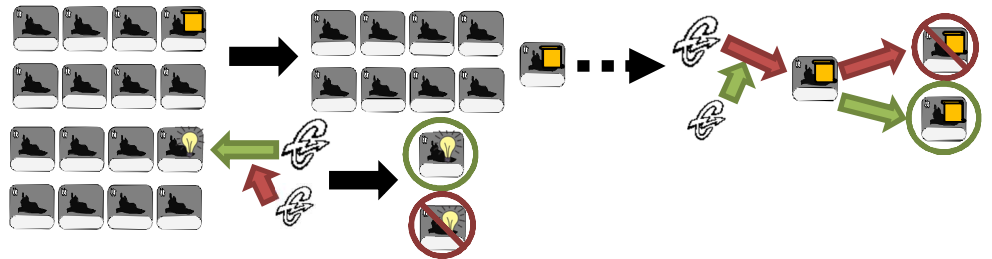
RESERVOIR /

HYDRO If River City in Network

Map	River Cities
USA	Seattle, Buffalo, Portland, Las Vegas
Germany	Konstanz, Passau, Wilhelmshaven, Dresden
Benelux	Luxembourg, Liege, Middleburg, Namur
Europe	Wroclaw, Warszawa, Salzburg, Trnava
Brazil	Ionora, Maraba, Portowelho, Sau Paulo
Spain	Salamanca, Barcelona, Caceres, Porto
China	Guiyang, Zhengzhou, Taiyuan, Nanjing
Korea	Chuncheon, Seoul, Busan, Jeju

BILLS

IDEAS



Players	Remove	Add	Star Cards	Bills & Ideas
2	12	4	NO	NO
3	14	6	YES	NO
4	14	8	YES	YES
5	10	10	YES	YES
6	10	12	YES	YES