



Lesoni 5 – iVolanivuli

Yavu ni iVurevure Tudei

VOSA VAKAVITI RARABA

Vakailavotaka na:

Ena veitauriliga kei:

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Na lesoni “**Yavu ni iVurevure Tudei**” na ivakamacala taumada ni yavu ni ivurevure ni igu kei na kedra yaga.

Ni oti na lesoni qo, e dodonu me matata vei keda na:

- Dui mataqali ivurevure ni igu
- iBalebale ni ‘ivurevure tudei’

- Sala eso ni vakayagataki ivurevure tudei
- Vakayagataki ni igu e vuravura nikua kei na kena revurevu ena veikabula
- Veimataqali cakacaka ni ivurevure tudei ni igu, kedra vinaka kei na kedra ca
- Yaga ni ivurevure tudei vei keda

TEVELI 2: iTuvatuva ni Lesoni

| Wase | Lesson Type |
|--------------------------------|-------------------|
| 1. Tou Veikilai | Vuli & iVakadre 1 |
| 2. iGu | Vuli |
| | iVakadre 2 |
| | iVakadre 3 |
| | iVakadre 4 |
| 3. Cakacaka ni iVurevure Tudei | Vuli |
| | iVakadre 5 |
| | iVakadre 6 |
| 4. iVurevure Tudei kei keda | Vuli |
| | iVakadre 7 |

Na ivolanimuli qo e yavutaki ena kena Salavata nei Qasenivuli (Trainers Guide). Sa vakarawarawataki na lewenivola ka vakalekalekataki, qai vakabitaki kina na droini, yaloyalo kei na kena ivakadre me ratou veimaliwai vinaka tikoga kina na lewe ni vuli kei qasenivuli ni toso tiko na vuli. Ke o gadreva na ikuri ni ivakamacala ni wase cava ga, mo raica na Salavata nei Qasenivuli.

Taba e waqanivila: Vakayagataki na mataqali ivurevure tudei. iVurevure: iTaba nei Elena Zhuravleva mai na Pexels (cake mawi), Yavala tiko na Piko-Haidro. iVurevure: Powerspouts, Niusiladi (cake matau), Vata ni Sola ena yanuyanu tu yawa e Viti. iVurevure: Zack Maraf (ra loma).

Moni Kila: Na Global Green Growth Institute e sega ni yalataka, se yalataka lo madaga, ni donu se tauoko na itukutuku ena ivola qo, se rawa ni veilewaitaki ke cala, ni dua e vakayagataka na vua ni itukutuku se iyaya se cakacaka e volai kina, wili kina ni beci na dodonu ni kena itaukei.

iVolavosa

Benisini – Waiwai mamada e yavala kina na idini eso.

Bukabulu – buka mv koala se kasi, buli ena veitabayabaki sa sivi mai na ivovo ni kabula.

Bukaqaqi – Kabula vakayagataki me buka, vb tikinikau se denimanumanu.

Draki Veisau – veisau na ituvaki ni draki e vuravura se dua na vanua.

iGu – ivakarawa ni cakacaka.

Kasi – haidrokaboni yavuyavu, ivurevure ni igu ena vakatakata, vakasaqa kei na qaqi livaliva.

Koala – vatu dei loaloa levu na kena kaboni se haidrokaboni vuki me buka. Okati me ivurevure ni igu yavuyavu, ni milioni na yabaki na kena buli.

Sela – na sela lailai e vukica na igu kemiki ni buka (haidrojini) kei na oksijeni me livaliva.

Tu vakarawarawa na igu – tu tawamudu na ivurevure ni igu qai saurawarawa

Vakadukaduka – Vakadukari na veikabula ena ka tani e vakacacana se vagaga.

Vākatakata kei vuravura – kena tubu vakamalua na katakata ni macawa kei vuravura, kainaki ni vu mai na tubu ni kasi tunumaka mv kaboni, CFC, kei na kasi vakadukaduka tale eso.

IVurevure tudei ni iGu – iGu e sega ni dau yavu kena ivurevure.

IVurevure yavuyavu – ivurevure ena yavu se qai sosomitaki ni otí e udolu se milioni na yabaki.

Waiwai (waiwai umauma) – Waiwai ni idini, vaka ni benisini sosoko.

1

Taumada – Tou
Veikilai Mada

VAKADRE 1

Vakamacalataki iko vakalekaleka vei ira na lewe ni kalasi. Tukuna se cava so o kila tu ena tabana ni ivurevure tudei kei na veika vakailavo, kei na cava so o namaka me na vua ni vuli qo.

2

iGu

2.1 Cava na iGu?

Na igu e levu tu na votukana, e dau veivukiyaki me solia mai na ka yaga.

E so na votukani igu qo:

iGu katakata – Nanuma toka nomu vakawaqa buka me toka kina na kuroniti. Nida volekata na buka waqa, eda vakila na kena igu.

YALOYALO 1: O bau kila se vakatakata vakacava na wai?¹



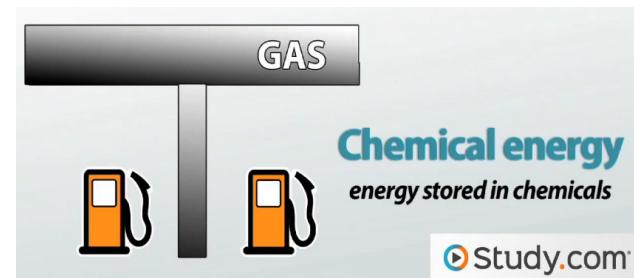
iGu mekeniki – qo ni soqoni na igu vuni (potential energy) kei na igu yavala (kinetic energy).² Qo ni biliga noda boto na igu ni kena idini.

YALOYALO 2: Biliga na waqa na iGu Mekeniki³



iGu kemiki – Na kemiki e tawa ena loma ni bateri, na igu livaliva e maroroi kina e rawa ni rogo kina na retio. Ni dau kama na buka, e sereki na igu kemiki qai vuki me katakata se igu mekeniki.

YALOYALO 3: Na waiwai na vu ni igu kemiki⁴



iGu Livaliva – qo na igu e drodrova na waya me igu ni cina ni noda vale, koronivuli &s.

2.2 iVurevure ni iGu

E 10 na ivurevure lelevu ni igu e vuravura raraba:

1. iGu Sola
2. iGu Cagi
3. iGu Bukaqaqi
4. iGu Waikatakata
5. iGu Ua kei na Mati
6. iGu Biau
7. iGu Haidro
8. iGu Haidrojini
9. iGu Niukilia
10. iGu Bukabulu (Kasi, waiwai, Koala, Benisini &s)

E rua na iwasewase lelevu ni ivurevure ni igu:

iVurevure Tudei kei na iVurevure Yavuyavu.

Na iVurevure Tudei – na igu e vu mai na iyaubula e dau sosomitaki ena noda delanigauna, mv cila ni siga, cagi, uca, ua kei na mati, biau, waikatakata &s. Na ivurevure tudei e yaga vakalevu ena va na tabana bibi: livaliva, vakatakata/vābatabata, kei na veilakoyaki.

Na iVurevure Yavuyavu – na iyaubula e sega ni rawa ni sosomitaki me veirauti kei na kena vakayagataki, mv bukabulu: koala, disili, benisini, kasi, haidrojini &s.

1 Veitaba: Vanuatu Team, GGGI

2 Wikipedia, "Mechanical energy", https://en.wikipedia.org/wiki/Mechanical_energy#:~:text=

3 IVurevure: Tropic Thunder Jet, <https://tropic-thunder-jet.business.site/>

4 IVurevure: Study.com, "Chemical energy", <https://study.com/>

2.2.1 iGu Sola

Na igu sola e rawa mai na matanisiga. Sa bucini oti e vica na icakacaka ni sola. Na igu e rawa vakalevu ena sola na livaliva kei na katakata.

YALOYALO 4: Cila ni Siga – iVurevure ni iGu⁵



2.2.2 iGu Cagi

Na igu cagi sa vakayagataki sara tiko vakalevu. Na ivocevoce lelevu e dau vukica na cagi me livaliva. E noda vanua e dau vakayagataki na igu cagi ena kedra vakamamacataki na itei se kau laivi na kuvu.

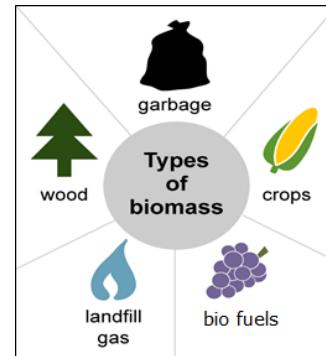
YALOYALO 5 & YALOYALO 6: Wasei tani na sorena ena cagi⁶ & i'Vocevoce ni Livaliva⁷



2.2.3 iGu bukaqaqi

Na bukaqaqi na tiki ni kau se manumanu e rawa kina na igu, se vakayagataki ena so na mataqali buliyaya, qai vakayagataki na kena benu ena buli igu. Na igu bukaqaqi e rawa mai kina na livaliva kei na katakata.

YALOYALO 7: So na mataqali bukaqaqi e rawa kina na igu⁸



2.2.4 iGu Waikatakata

Na igu waikatakata na igu e rawa mai na katakata kei vuravura. Kena katakata e vu mai na vanua titobu sara e lomai vuravura.⁹

YALOYALO 8: Waikatakata – vakavure cawā¹⁰



5 iVurevure: DepositPhotos.com, <https://depositphotos.com/stock-footage/sun.html>

6 iVurevure: Shutterstock images, <https://www.shutterstock.com/image-photo/bali-indonesia-may-6-rice-winnowed-141503299>

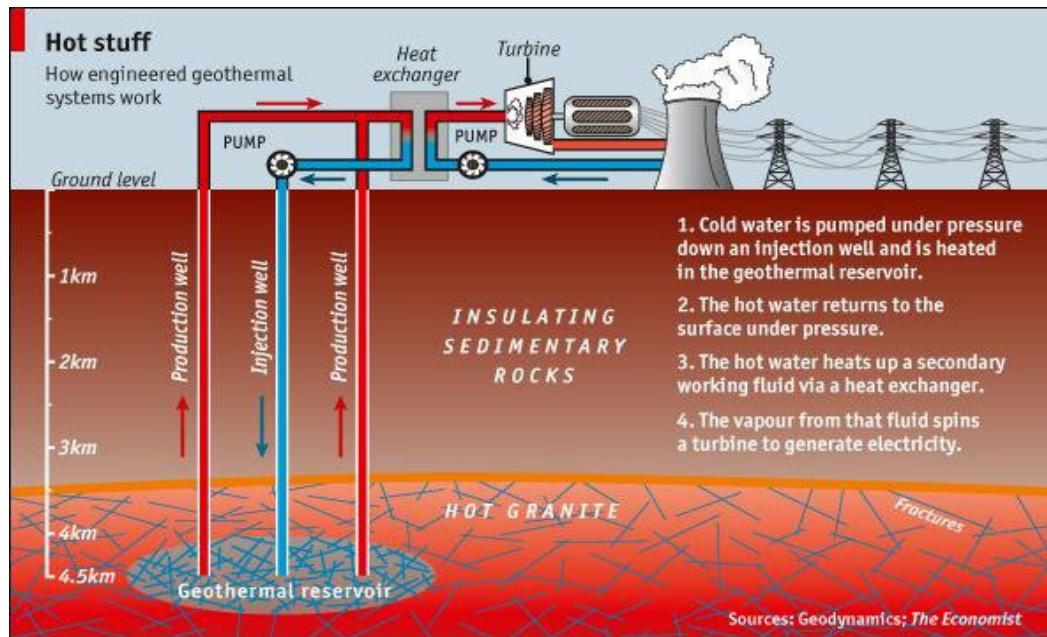
7 iVurevure: Wikimedia Commons, Wind-Turbine, <https://upload.wikimedia.org/wikipedia/commons/a/ad/Wind-turbine-icon.svg>

8 iVurevure: WordPress.com, Environment Sustainability Biofuels, <https://environmentsustainability2017.files.wordpress.com/2017/10/blog-24.jpg?w=768>

9 Yavutaki ena International Renewable Energy Agency (IRENA), <https://www.irena.org/geothermal>

10 Clean Economy Center, <http://cleaneconomycenter.org/benefits-and-disadvantages-of-using-geothermal-energy/>

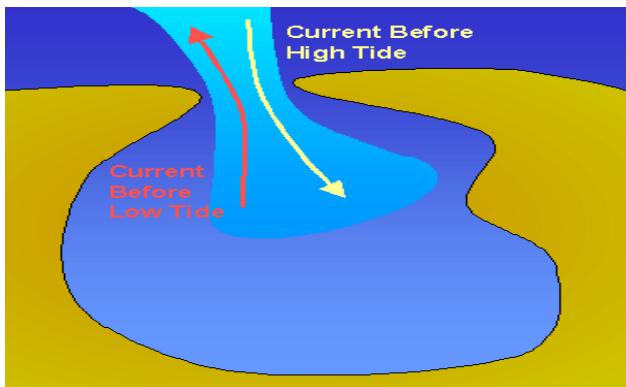
YALOYALO 9: Vakayagataki na Waikatakata¹¹



2.2.5 iGu Ua kei na Mati

Na igu qo e vu mai na ua kei na mati qai vuki me igu yaga, vb livaliva.¹²

YALOYALO 10: iTovo ni ua kei na mati¹³



YALOYALO 11: EMEC 4.5MW Vakatovolei, iQaqi ni ua kei na mati mai Korea¹⁴



2.2.6 iGu Biau

Na igu biau e vuki kina me igu na biau ni wasa. Na igu qori e yaga ena levu na cakacaka, wili kina na qaqi livaliva kei na igu mekeniki.¹⁵

YALOYALO 12: Biau¹⁶



11 IVurevure: Research Gate, https://www.researchgate.net/figure/Figure-1-3-Geothermal-energy-process_fig3_334729294

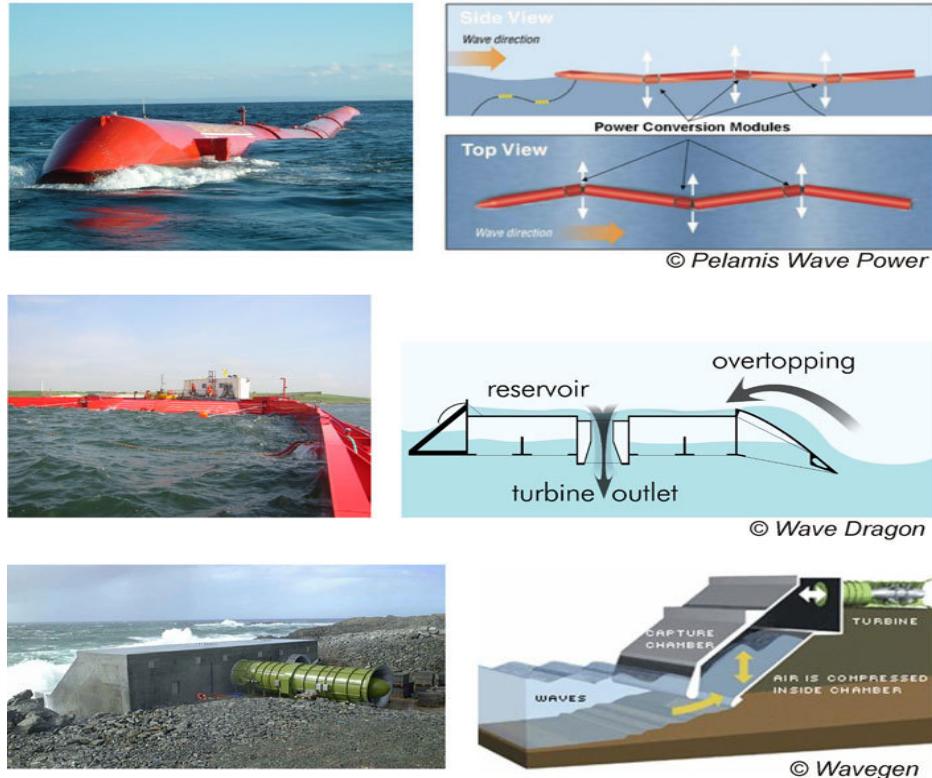
12 Intertek, "Tidal Energy", <https://www.intertek.com/energy-water/tidal-energy/>

13 IVurevure: The Scuba Tutor, Tidal currents, <http://www.scuba-tutor.com/diving-environment/dive-site-conditions/tidal-currents.php>

14 IVurevure: Renewables Now, <https://renewablesnow.com/news/emec-to-help-develop-45-mw-tidal-energy-test-site-in-korea-706142/>

15 Open El, "Wave Energy", https://openei.org/wiki/Wave_Energy

16 IVurevure: Wqpmag, "Water quality", <https://www.wqpmag.com/water-quality>

YALOYALO 13: Mataqali jenereita ni biau¹⁷**2.2.7 iGu Haidro**

Na igu haidro e vu vakalevu mai na savu se drodro, qai levu na kena yaga.

YALOYALO 14: Wai lutu mai vakayawa qai vanataki¹⁸**2.2.8 iGu Haidrojini**

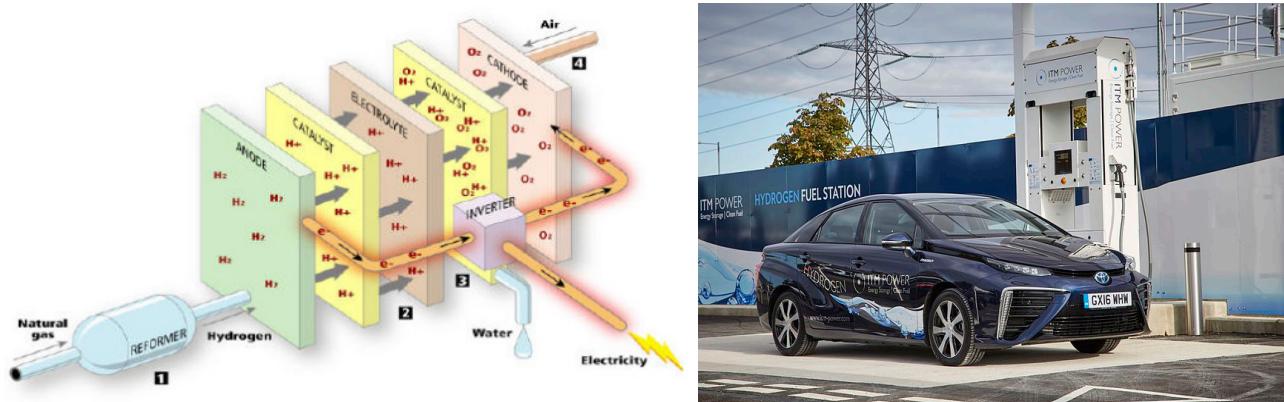
Na haidrojini e buli kina na wai (H_2O), na elemede kune vakalevu e vuravura. E rua na ikatolu ni wai e haidrojini, ia e dau coko vata kei na elemede tale eso. Ni sa kali tani, e rawa ni qaqi kina na livaliva se yavala kina na idini ni lori. Na haidrojini na ivurevure ni igu yaga sara, qai rawa ni vakayagataki na selame buli me waiwai, me vaka ena Yaloyalo 15.

17 IVurevure: Research Gate, https://www.researchgate.net/figure/A-sample-of-wave-energy-convertersthat-have-come-far-in-development-Top-Pelamis_fig5_265007458

18 IVurevure: The Conversation, <https://theconversation.com/rivers-rain-and-releases-what-happens-when-you-dam-a-waterway-3934>

19 Veitaba: Worcester Polytechnic Institute FCC Public, <http://www.odbornecasopisy.cz/en/post/new-membrane-technology-that-may-help-make-hydrogen-fuel-cell-vehicles-viable--2451>

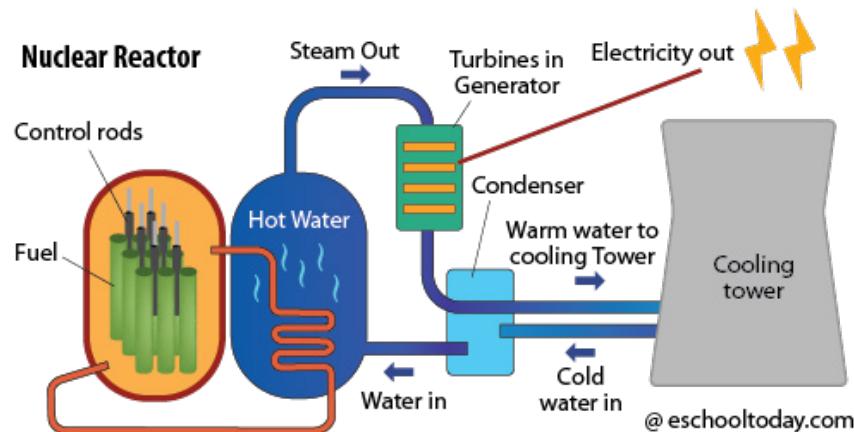
YALOYALO 15: Motoka Sela¹⁹ kei na Haidrojini²⁰



2.2.9 iGu Niukilia

Na igu niukilia noda vakayagataka na veicoqacoqa niukilia me rawa kina na igu vakatakata, qai vakadrodroi yani na kena cawā ina iqraqi ni livaliva.

YALOYALO 16: iQaqi Niukilia²¹



2.2.10 Bukabulu (Kasi, Waiwai, Koala, Benisini &s.)

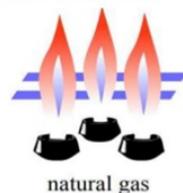
Na bukabulu na buka e buli vakataki koya ga mai na ka bula vuca se mate e loma ni qele, e maroroi kina na matanikabula era se vu mai na cila ni siga ena itabagauna makawa, era qai dau sereka na igu nira kama.²²

YALOYALO 17: Mataqali Bukabulu²³

► Coal- is a solid fossil fuel

► Petroleum- is a liquid fossil fuel.

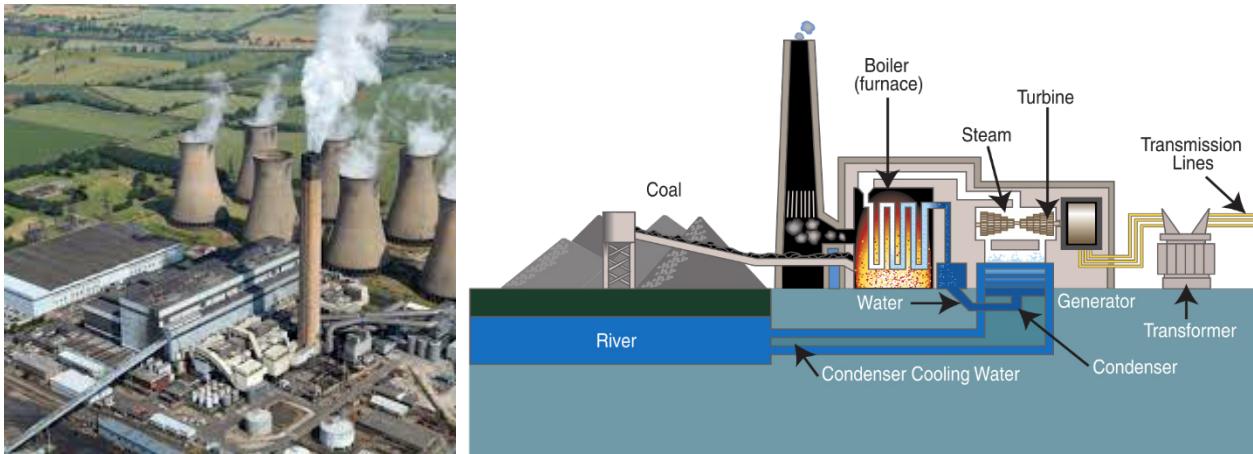
► Natural Gas



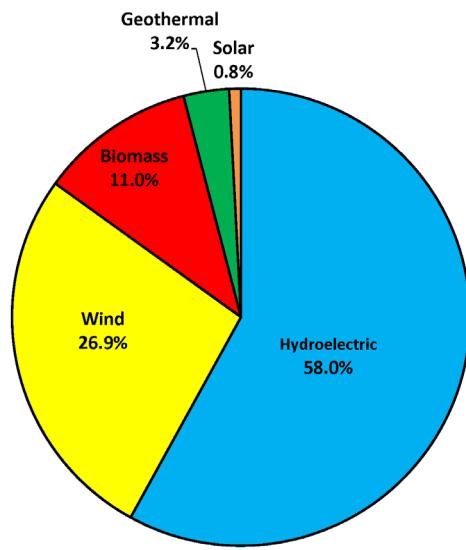
20 Yavutaki ena, KnowItInfo, "What is Uranium Energy?", <https://knowitinfo.com/what-is-uranium-energy/>

21 IVurevure: Know It Info, "What is Uranium Energy", <https://knowitinfo.com/what-is-uranium-energy/>

22 Wikipedia, "Fossil fuel", [23 Slideshare.net, "Slide 2 -Fossil Fuels", <https://pt.slideshare.net/jbishopgcms/fossil-fuels-5668194>](https://en.wikipedia.org/wiki/Fossil_fuel#:~:text=)

YALOYALO 18: Qaqi ni Livaliva Koala²⁴ & iCakacaka ni qaqi livaliva ena koala²⁵**2.3 Vakayagataki iGu e Vuravura kei na kena revurevu ena veikabula**

YALOYALO 19: Mataqali iVurevure Tudei mai Merika 2015²⁶



Me vaka e laurai ena Yaloyalo e cake, e vakayagataki vakalevu na haidro me ivurevure tudei, tarava na cagi, bukaqaqi kei na waikatakata. Me yacova nikua, e 24% walega ni igu e vuravura e vu mai na ivurevure tudei. Noda vakayagataki na ivurevure yavuyavu e levu na kena revurevu e vuravura.

2.4 Revurevu ni iVurevure e Vuravura

Me vaka ni se vakayagataki vakalevu na ivurevure yavuyavu, vb bukabulu, e levu tu na kena revurevu e vuravura, mv:

2.5 Vakatakata kei Vuravura, Tubu ni Waitui

Qo na vua ni noda vakayagataka na bukabulu. Na mataqali buka qo e kuvuraka na kasi tunumaka, e sogo kina na katakata e vuravura – eda sa katakata kece mai e veiyabaki.

Na kasi tunumaka (wili kina na kaboni CO₂, kasi wai kei na kasi vanataki mv motin) e kune e macawa e delai vuravura. Nodra cakacaka mera sogota na katakata ni siga e dri mai delai vuravura.

YALOYALO 20: Kuvuraki mai na volau na kasi tunumaka²⁷



24 IVurevure: International Energy Agency, <https://www.iea.org/reports/coal-fired-power>

25 IVurevure: Energy Education, https://energyeducation.ca/encyclopedia/Coal_fired_power_plant

26 Tukutuku yavutaki ena "World Energy Consumption", Wikipedia, May 2021, https://en.wikipedia.org/wiki/World_energy_consumption

27 IVurevure: Wikimedia commons, 'Steam Emission at Asphalt Batch Plant', https://commons.wikimedia.org/wiki/File:STEAM_EMISSION_AT_THIS_ASPHALT_BATCH_PLANT_CONSISTS_OF_85_PERCENT SAND DUST,_ACCORDING_TO_THE_AIR_-_NARA_-_542544.jpg

Na vakatakata qo e waicala kina na waicevata ni pole e
rua, mani tubu kina na waitui. Na tubu qo e vakilai e noda
veibaravi, e so mada na koro era luvu ni ua levu. E luvu talega
na iteitej ena waitui mani ca kina.

YALOYALO 21: Vakacacana tiko noda veiyanuyanu na tubu ni waituj²⁸



2.6 Draki veisau

Tubu tiko na katakata kei vuravura – veisau vata kaya na draki. E dau veivukiyaki na draki kei vuravura, vakatau ena katakata ni wasawasa kei na vanua. Tubu na waluvu kei na lauqa. Tubu na katakata ena kena vula, tubu na liliwa ena kena vula. E vakacacani talega kina na iteitei.

YALOYALO 22: Na draki veisau e vakacacana na itei²⁹



2.7 Dredre na iGu

Ni lailai na bukabulu e noda vanua, eda dau volia mai na waiwai me vaka na disili me rawa kina na livaliva kei na veilakoyaki. Kena ibalebale ni levu noda ilavo e vakayagataki ena voli waiwai mai vanuatani. Ke qai tubu vakasauri na isau ni waiwai baleta na ivalu se na matetaka, eda sa leqa saraga.

2.8 Sova Waiwai kei na Vakadukaduka

Sa vakacacana oti vakalevu na tasova ni waiwai ena wasawasa na lase, ika, kei na veikabula ni waitui. Na vakadukaduka ni tasova na waiwai e rawa ni vakacacana talega na keda e dau rawa mai waitui. Era bau mate vakayauyau talega kina na manumanuvuka ni wasa, manumanu ni vanua kei na udolu vakaudolu na ika.

YALOYALO 23: Tasova ni waiwai, revurevu ni vakayagataki bukabulu³⁰



Volavola:

28 IVurevure: SPREP, July 2013, https://www.sprep.org/news/sea-level-solomon-islands-predicted-rise-over-8mm-coming-century?_cf_chl_jschl_tk_

29 IVurevure: GGGI, Vanuatu.

30 SlideShare, Slide 7 Water Pollution, July 2015. <https://www.slideshare.net/Hossian/water-pollution-50095046>

IVAKADRE 2

Vakamacalataka na ivurevure tudei. Cava meda vakayagataka kina na Ivurevure tudei? Dou veiwaseitaka na lewe ni kalasi.

IVAKADRE 3

Vola na “ivurevure tudei” se “ivurevure yavuyavu” ena yasa ni yaloyalo qori.



Cagi³¹



Bukabulu (Koala)³²



Bukaqaqi³³

31 Wikimedia Commons, "Blowing wind", https://commons.wikimedia.org/wiki/File:Blowing_wind.jpg

32 Lumen learning.com, "Energy Independence", <https://courses.lumenlearning.com/boundless-politicalscience/chapter/energy-and-environmental-policy/>

33 iVurevure https://greenliving.lovetoknow.com/Making_Biodiesel_at_Home

| | |
|---|---|
| |  |
| Bukaqaqi ³⁴ | |
|  | |
| Haidro (Wai) ³⁵ | |
| |  |
| | Sola ³⁶ |
|  | |
| Waikatakata ³⁷ | |

34 Wikimedia Commons, "Sugar cane", https://commons.wikimedia.org/wiki/File:Sugar_Cane_rows.jpg

35 Wikimedia Commons, "Hydro dams", https://commons.wikimedia.org/wiki/File:Hydro_dams.jpg

36 IVurevure: DepositPhotos.com, <https://depositphotos.com/stock-footage/sun.html>

37 Clean Economy Center, <http://cleaneconomycenter.org/benefits-and-disadvantages-of-using-geothermal-energy/>

IVAKADRE 4

1. Cava so na revurevu ni vakayagataki bukabulu (mv benisini)?

2. Veivosakitaka vakaiwasewase na leqa dou sotava tiko baleta na draki. Vakasamataka mada se cava so sa bau veisau ena levu na yabaki.

3. Cava o nanumi ni iwali ni draki veisau?

3

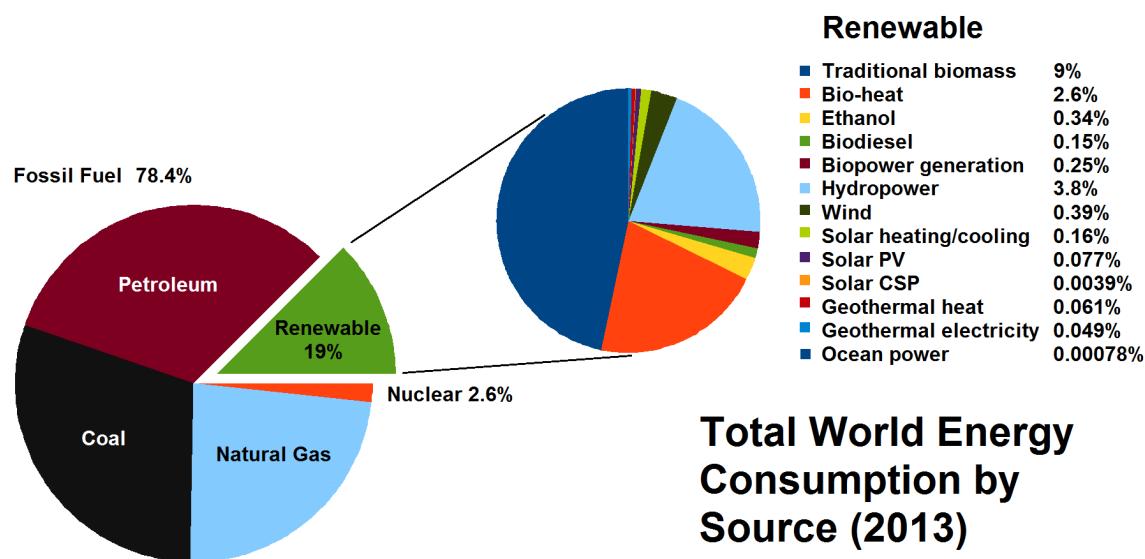
Cakacaka ni
ivurevure tudei

Na igu tudei na igu e rawa mai na ivurevure tudei era dau vakavoutaki ena noda delanigauna. E wili me igu savasava, qai sega sara ni vakacacana na veikabula, se vakalailai sara.

Na ivurevure tudei e dau rawa vakalevu kina:

- Qaqi livaliva
- Vakatakata, vakasaqa
- Veilakoyaki

YALOYALO 24: iVurevure tudei kei na kena yavuyavu³⁸



3.1 Vakayagataki ivurevure tudei

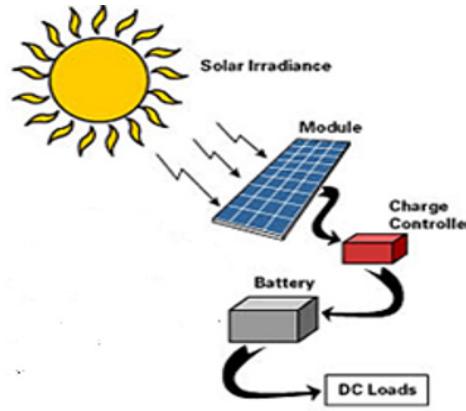
Ena wase qo, eda na veivosakitaka e so na mataqali cakacaka ni vukici ivurevure tudei me igu yaga.

3.2 Sola

Na sola e soqona na igu ni matanisiga qai vukica me livaliva se katakata.

Na livaliva e rawa mai na ulunisola (Solar PV Module), koya e vukica na siga me livaliva. Na livaliva qo e livaliva dodonu (DC, direct current), e rawa ni jajitaki kina na bateri me vakayagataki malua.

YALOYALO 25: Livaliva ni Sola³⁹



38 Yavutaki ena Power Technology, <https://www.power-technology.com/features/featurethe-worlds-most-used-renewable-power-sources-4160168/>

39 IVurevure: GGGI, Fiji

Na katakata e rawa mai na ulunisola wai (solar collector). Na ulunisola wai e soqona na katakata ni siga me katakata kina na wai. E rawa talega ni vakayagataki na sola ena sigasigani (yaqona, ika &s).

YALOYALO 26: Katakata mai na Sola⁴⁰



YALOYALO 27: Sigani Yaqona⁴¹



Kena vinaka

- Na ulunisola e sega na kena gacagaca yavavala, e rawarawa sara na qarava.
- E bini tu na igu sola ena Pasifika.
- E rawarawa sara na vakaduri sola lalai ni vale, sega ni gadrevi na cakacaka lelevu mv baniwai se vale.
- Tubu kina na cakacaka drokadroka
- Na igu sola e tu ga e veisiga, vakalevu se vakalailai.
- Na igu sola e sega ni vakadukaduka, se kuvuraki kasi tunumaka me vakatakatataki vuravura.

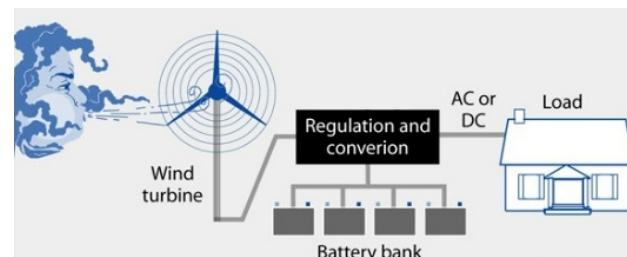
Kena ca

- Na igu sola e dau rawa ga ena siga, ia e rawa ni maroroi ena bateri me vakayagataki ena bogi.
- Na bateri ni sola e saulevu qai ca totolo.
- Na sola lelevu e gadrevi kina na vanua levu me duri kina.
- Saulevu kena iyaya kei na kena vakaduri.
- Saulevu na iyaya livaliva dodonu (DC), saurawarawa na iyaya livaliva dri (AC).

3.3 iGu Cagi

Na igu yavala (kinetic energy) ena cagi e dau rawa mai ena ivocevoce ni cagi (wind turbine). Na igu ni cagi e vakacowiritaka na yame ni ivocevoce. Na vu ni ivocevoce e sema kei na tolonikaukamea, koya e yavalata na idini me rawa kina na livaliva. Na Yaloyalo 28 e ra e laurai kina na ivocevoce ni cagi kei na gacagaca ni kena idini. E kunekeuneyadua sara na ivocevoce ni cagi e noda vale, e dau vakalevu me vica vata me ka ni bisinisi, qai vakatokai me 'loganicagi' (wind farm) me vaka ena Yaloyalo 30.

YALOYALO 28: Vakayagataki igu cagi⁴²



Dikeva mada na Yaloyalo 28 mo raica kina na gacagaca qo:

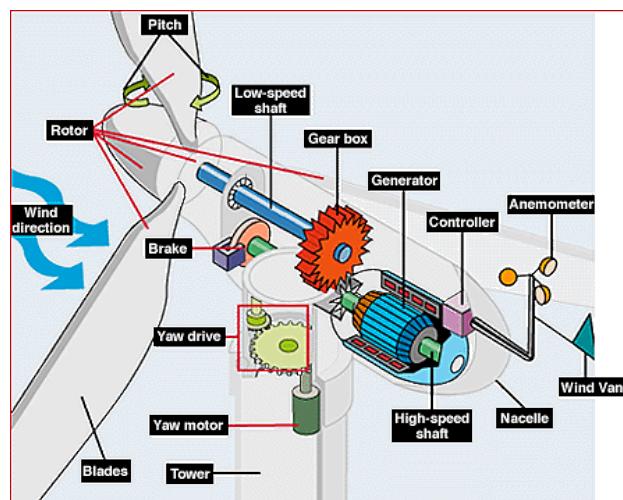
- Yameyame – talave qai cowiri ni liwava na cagi, qai cowiri kina na vuna.
- Vunivocevoce – yamena kei na vuna, vukici kina na igu ni cagi me igu cowiri.
- Qia – isema ni tolonikaukamea ni ivocevoce cowiri malua, vakatotolotaka na cowiri ni tolonikaukamea e sema kei na idini.
- Idini se jeneraita – rawa kina na livaliva dri (AC).
- iVakarau ni cagi – vakarautaka na kaukaua ni cagi qai vakauta kena itukutuku ina kena idoladola (controller).
- Kena idoladola – yavalata se vakamatea na idini, vakatau ena kaukaua ni cagi.

40 GGGI - Fiji, <https://gggi.org/global-program/gggi-gcf-portfolio/>.

41 Yavutaki ena Fiji Sun, "Kava Demand Creates Trade Opportunity Between Fiji, Madang, August 2018, <https://fijiisun.com.fj/wp-content/uploads/2015/11/Kava-1-750x403.jpg>

42 IVurevure: www.energy.gov, Yavutaki ena, "What is Solar-Wind Hybrid Power Plant? Solar Mango, <http://www.solarmango.com/ask/2015/10/23/what-is-a-solar-wind-hybrid-power-plant/>

- Na ivakalakala – moica na yameyame me kua na yavale ena na cagi de qai totolo sivia ni kaukaua na cagi.
- Bereki – tarovi kena cowiri ni tubu koso na leqa.
- Na idusinicagi (wind vane) – vakarautaka na matanicagi qai vakau itukutuku ina uli (yaw drive) me qara donu kina na ivocevoce.
- Uli (yaw drive) – Moica na ivocevoce me qarava tikoga na cagi.
- Duru – taqa e uluna na gacagaca kece ni ivocevoce. Na balavu ni duru, na levu ni igu e rawa mai na cagi, levu talega ni livaliva e qaqi.
- Kena vale (nacelle) – tiko kina na qia, tolonikaukamea, idini, idoladola kei na bereki.

YALOYALO 29: Gacagaca ni ivocevoce ni cagi**YALOYALO 30:** Loganicagi mei Butoni, Sigatoka⁴³

Kena vinaka

- Bau levu toka na igu cagi e noda veiyanuyanu.
- Na ivocevoce me ka ga ni vale e rawarawa ni vakaduri.
- E tu ga na cagi siga kei na bogi, veisau ga na kena kaukaua.

- Na igu cagi e sega ni vakadukaduka se kuvuraki kasi tunumaka me katakata kina na vuravura.

Kena ca

- E saulevu na ivocevoce ni cagi qai dredre kena qaravi.
- Vinakati me vakarautaki na ivakatautauvata ni kaukaua ni cagi me dau rauta me rawa kina na livaliva.
- De na tiko na cagi, sega ga ni rauta me rawa tuga kina na livaliva.
- Segu ni kilai rawa na levu ni livaliva ni dau veiveisau na kaukaua ni cagi.
- Na ivocevoce ni cagi e vakarairaicataka na vanua, e so talega e rogolevu.
- Na ivocevoce ni cagi e rawa ni mate kina na manumanuvuka.

3.4 iGu bukaqaqi

Na bukaqaqi (biomass) nida vakayagataka na tiki ni kau se manumanu me rawa kina na igu (katakata kei na livaliva). E rawa ni kau tei saraga me buka (dovu), benu ni kau se veikau, benu ni kakana, denimanumanu (maniwa), se benu ni tamata mai na iqaqi ni waicā.

Na vakamakama ena iqaqi ni benu e kuvuraki kina na kaboni, ia e wili me ivurevure tudei baleta na kaboni qori era na tiloma na itei vovou. Qo na sala e vukici vakalevu kina na bukaqaqi me igu:

- Kama na kau – E kama na kau me rawa kina na katakata, qai rawa tale kina na cawā ni qaqi livaliva. Qo e caka vakalevu e noda veikoro ena vakasaqa.

YALOYALO 31: Kau (bukaqaqi) ena vakasaqa⁴⁴

43 Veitaba: Fiji Sun

44 IVurevure: Biomass Stoves in Bengaluru, <https://dir.indiamart.com/bengaluru/biomass-stoves.html>

YALOYALO 32: Qaqi ni dovu e Viti – Vakamai na benu ni qaqi dovu (bagasse) me rawa kina na livaliva⁴⁵



- Cakacaka kemiki – Qo ni vakayagataki na bukaqaqi me rawa kina na kasibulu (methane) kei na waiwai (bioldisili se bioethanol). E vakamai na kasibulu se waiwai se vakayagataki ena boila se idini me rawa kina na igu.

YALOYALO 33: Vakayagataki kasibulu mai Tuvalu⁴⁶



Kena vinaka

- E bau tu rawarawa na bukaqaqi ena noda veiyanuyanu e tu kina na veikau se na iteitei lelevu.
- Rawarawa sara – vaka ga na vakamakama me rawa kina na igu katakata.
- Saulailai se sega ni saumi.
- Rawa ni maroroi me vakayagataki malua, sega ni gadrevi na bateri &s.

Kena ca

- Gadrevi na idini verevere me rawa kina na livaliva.
- Ni dau kama e kuvuraki kaboni kei na kubou.
- Bau dede kena tubu tale, me ta gona mai vakarauta ni vakayagataki vakatabakidua me buka.
- Vakama buka se vakayagataki kena waiwai e rawa ni vakaleqa noda bulu.
- Segu so ni mana me vaka na bukabulu.
- Na kau ni bukaqaqi e osota na vanua.
- Rawa ni tini ena kena talaki na veikau.

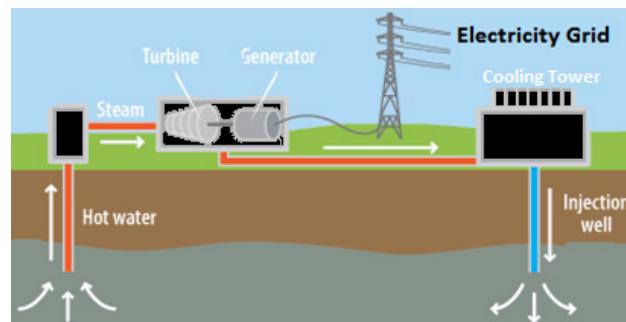
45 IVurevure: The Fiji Sugar Corporation Ltd.

46 IVurevure: Tweet by GIZ Pacific, <https://twitter.com/GZPasifika/status/1125605100439756800>

3.5 iGu Waikatakata

E vakayagataki na cawā se waikatakata e loma i vuravura, me yavala kina na idini ni livaliva.

YALOYALO 34: Cakacaka ni Waikatakata⁴⁷



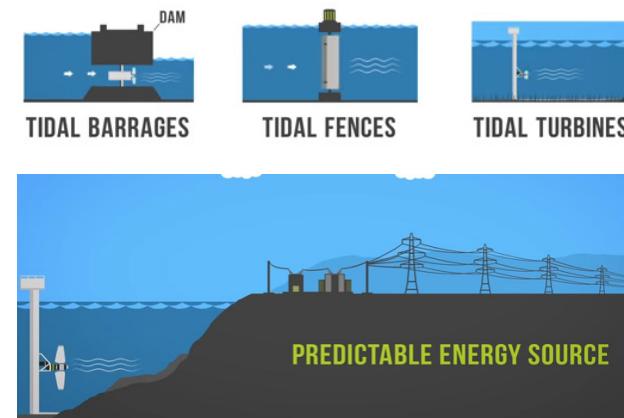
Kena vinaka

- Ni sa kune oti na kena ivurevure, na igu waikatakata e voleka ni tawamudu kena yavala.
- Na igu waikatakata e sega so ni veitubuyaki, e ivurevure dei ni livaliva.
- Na igu waikatakata e vakayagataki kina na waikatakata mai lomai vuravura, ni qai liliwa e rawa ni vakayagataki tale.
- Na igu waikatakata e yaga talega ena vakaliliwa (air-conditioning) kei na vakatakata.
- Na igu waikatakata e sega ni vakadukaduka se kuvuraki kasi tunumaka me katakata kina o vuravura.
- Kena ca
- Na igu waikatakata e kune ena vica ga na vanua ena Pasifika
- Na iqaqi ni waikatakata e ka lelevu qai gadrevi na iyaya saulelevu me qaqi kina na livaliva.
- Na igu waikatakata dau rui saulevu me caka ga e vale, veitalia ni voleka na waikatakata.
- Na igu waikatakata e rawa ni vakavuna na uneune, ni veisautaki kina na delai vuravura.

3.6 Na igu ua kei na mati

Na igu ua kei na mati na kena vukici na igu mai na ua kei na mati me livaliva.

YALOYALO 35: Cakacaka ni Ua kei na Mati⁴⁸



Kena vinaka

- Na igu ua kei na mati e tu vakarau tu ga, dina ni duidui na kena kaukaua.
- Na igu ua kei na mati e rawa ni yavala kina na idini ni livaliva lelevu baleta na koro se taoni.
- Na igu ua kei na mati eda kila rawa ena dua na yabaki.
- Na igu ua kei na mati e rawarawa kena lewai qai sema kei na lawa levu.
- Na igu ua kei na mati e sega ni vakadukaduka se kuvuraki kasi tunumaka me katakata kina o vuravura.
- Na igu ua kei na mati e sau rawarawa kena qaravi.
- E sivia na ivurevure tudei tale eso ena kena gumatua.
- Kena ca
- Na igu ua kei na mati e rawa ga ena so na vanua mai waitui.
- E saulevu na vakaduri ivocevoce kei na iyaya tale eso e loma ni waitui.
- Na igu ua kei na mati e via qaravi wasoma, kei na so na gacagaca kunekune dredre me cici vinaka kina.
- Vakaleqā na kabula ni waitui.

3.7 IGU BIAU

Na iGu Biau kena rawa na igu mai na biau ni wasa. Kena idini na 'converter'. E yavavalava ena biau qai biligi kina e dua na mataqali wai me yavalata na moto, koya e sema kei na idini ni livaliva.

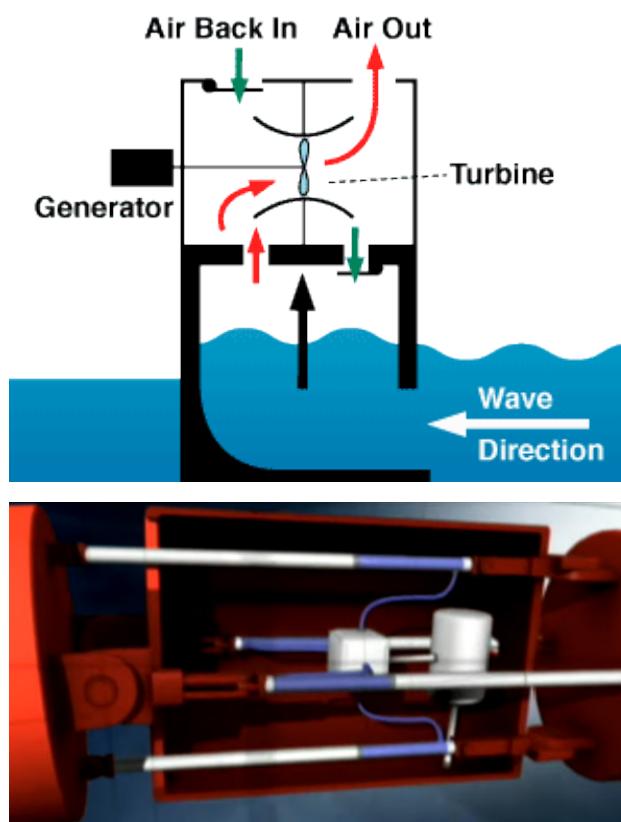
47 IVurevure: EPA- Student's Guide to Global Climate Change, <https://mbgna.umich.edu/geothermal-energy-what-it-is-how-it-works/>

48 IVurevure: NRG Initiative, Tidal Power, December 2015, <https://nrginitiative.files.wordpress.com/2015/12/tidal-energy-101.jpg>

YALOYALO 36: Idini ni Biau⁴⁹



YALOYALO 37: Cakacaka ni dua na mataqali idini ni biau⁵⁰



Kena vinaka

- Na iGu Biau e tu ga, dina ni duidui na kena kaukaua.
- Na iGu Biau e rawa ni yavala kina na idini lelevu ni livaliva me baleta na koro se vanua.
- Na iGu Biau e tu vakarawarawa vei ira na vakaitikotiko e baravi.
- Na iGu Biau e sega ni vakayagataki kina na vanua mamaca.
- Na iGu Biau e sega ni vakadukaduka se kuvuraki kasi tunumaka me katakata kina o vuravura.
- Na iGu Biau e kilai rawarawa se vica na igu ena rawa kina.

Kena ca

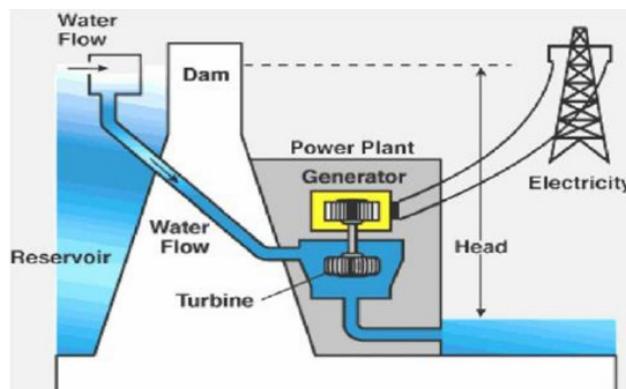
- Na iGu Biau e rawa ga ena so na vanua mai waitui.
- Dina ni tu ga na iGu Biau – e veitubuyaki vakalevu qai dau veiveisau gona na kena igu.
- Na iGu Biau e gadrevi kina na ivocevoce saulevu kei na vale lelevu e baravi se loma ni wai.
- Na iGu Biau e gadrevi kina me qaravi wasoma kei na iyaya kunekune dredre me cici vinaka kina.
- E rawa saraga ni vakaleqai vakaca ena cagilaba se cagi lelevu.
- Ena yaga ga ena iqaqi ni livaliva se taoni voleka e waitui.

3.8 Na iGu Haidro

Na iGu Haidro e rawa mai na savu se drodro. Qo e dau kune wasoma, e Viti madaga e rauta ni 60% ni noda livaliva e vu mai na iGu Haidro. E tiko talega na haidro lalai (Piko se Maikro) baleta na vuvale se itikotiko.

49 IVurevure: Wikipedia, Wave Power, https://en.wikipedia.org/wiki/Wave_power#/media/File:Pelamis_at_EMEC.jpg

50 The Renewable Energy Website, Tidal Power Turbine Alternatives, <http://www.reuk.co.uk/wordpress/tidal/introduction-to-tidal-power/>

YALOYALO 38: Cakacaka ni iGu Haidro⁵¹Kena vinaka

- Na iGu Haidro e tu ga, dina ni duidui na kena kaukaua, vakavo ga ni lailai na kena uca.
- Na iGu Haidro e rawa ni yavala kina na idini lelevu ni livaliva baleta na le levu.
- Na iGu Haidro Piko e rawa ni vakalivaliva kina na vale yadua.
- Na iGu Haidro e dei tu ga, e rawarawa gona ni lewai qai sema kei na lawa levu.
- Na iGu Haidro e sega ni vakadukaduka se kuvuraki kasi tunumaka me katakata kina o vuravura.
- E levu na yanuyanu lelevu ni Pasifika e tiko na kedra colo kei na waidrodro, e ganiti ira gona na haidro.
- Kena ca
- Na iGu Haidro e sega ni rawarawa ena yanuyanu lalai sega na kena colo se waidrodro.
- Na ivocevoce ni haidro e gadrevi me vakadurī vakavinaka, me tara na kena baniwai se keli na ikeli me davo kina na paipo.
- Na iGu Haidro me dau qaravi wasoma, vb ni tau bi na uca, de curuma na deniwaluvu na ivocevoce se na vulu.
- Lailai ni wai ena vulaimaca e rawa ni lailai kina na livaliva e qaqi.

3.9 Na iGu Haidrojini

Na iGu Haidrojini e vu mai na waiwai haidrojini. Na waiwai haidrojini e dau kama vata kei na oksijeni qai sega na kena kuvi. E vakayagataki ena sela se na idini ni lori. Na sela lailai e vukica na igu kemiki ni buka (haidrojini) kei na oksijeni me livaliva ena rua na veisau ni oksijeni (redox). Sa tekivu vakayagataki ena lori sela, me vaka na motoka, ka sa dede kena vakayagataki ena basi. E vakayagataki talega ena rokete ni maliwa lala.

YALOYALO 39: Basi Sela ni Haidrojini⁵²Kena vinaka

- Segi ni vakadukaduka, kuvuraka ga na wai savasava.
- Na haidrojini e rawa ni buli qai maroroi me vakayagataki malua – rawa talega ni veikauyaki.
- Vica na ivurevure tudei e rawa ni buli kina na haidrojini.
- Rawarawa sara na vakayagataka na kena sela, ni sega na gacagaca yavala – mana sara.
- Kena ca
- Na haidrojini e rerevaki sara, rawa ni kacobote.
- Yaya ni kena vakadurī e saulevu.
- Vereverea sara kena cakacaka, dredre kena qaravi.

51 IVurevure: Slideshare.net, <https://www.slideshare.net/salmanJailani/study-about-the-types-of-power-plants-and-how-electricity-is-produced>

52 IVurevure: Wikipedia, Hydrogen Fuel Cell Bus, https://en.wikipedia.org/wiki/File:Hydrogen_fuel_cell_bus.jpg#/media/File:%20%20Hydrogen_fuel_cell_bus.jpg

TEVELI 3: Duidui ni Veimataqali iVurefure Tudei

| Mataqali Ivurevure tudei | Tu vakarawarawa | Vakalevutaki | O cei e rawa ni vakaduria, yavalata, qarava? | Gadrevi me maroroi | Vakacacana na Veikabula |
|--------------------------------|--|------------------------------|--|-----------------------|---|
| Igu sola | Ni cila na siga | Rawarawa | Koya ga sa tuberi kina | Bateri | Benu ni sa otí na kena gauna |
| Igu cagi | Ni liwa na cagi | Rawa ni vakuri na ivocevoce | Koya ga e vakaivola kina. | Bateri | Samaki na vanua kei na kau |
| Igu waikatakata | Lo | Vakatau ena levu ni iyaubula | Koya ga e vakaivola kina | Sega | Veisau ni loma ni qele. |
| Igu ua kei na mati | Veigauna | Rawa | Koya ga e vakaivola kina | Sega | Rawa ni vakaleqā na kabula ni waitui |
| Igu biau | Veigauna | Rawa | Koya ga e vakaivola kina | Sega | |
| Igu bukaqaqi | Lo | Rawa | Koya sa tuberi kina | Sega | Kuvuraki kaboni kei na kubou |
| Igu haidro | Lo, vakavo beka ena vulaimaca | Rawa | Koya ga sa tuberi kina | Sega | Kena tara e vakacacani kina na veikabula baleta na kelikeli kei na vakadrodroi ni wai |
| Igu haidrojini | Vakatau ena kena rawa na waiwai haidrojini | Rawa | Koya ga sa tuberi kina | Rawa ni maroroi | Sega |

IVAKADRE 5

Droinitaka qai veivosakitaka vakalasi na veimataqali ivurevure ni igu kune ena nomu yasayasa se vanua.
Tukuna se ivurevure tudei se yavuyavu.

IVAKADRE 6

Veivosakitaka vakalasi se ivurevure tudei cava o vinakata mai na koro, baleta?

Volavola:

4

iVurevure tudei
kei keda

Na ivurevure tudei e yaga e vale ni rawa kina na livaliva me cici kina na iyaya, ia e yaga talega ni vauci keda vata vakoro se vakaitikotiko. Na ivurevure tudei e rawa ni torocake sara kina noda veimaliwai. Tou dikeva mada na revurevu ni ivurevure tudei vei keda.

4.1 Veivauci

YALOYALO 40: Mau na keda ivau ena cakacaka vata⁵³



4.2 Le levu – sau lailai

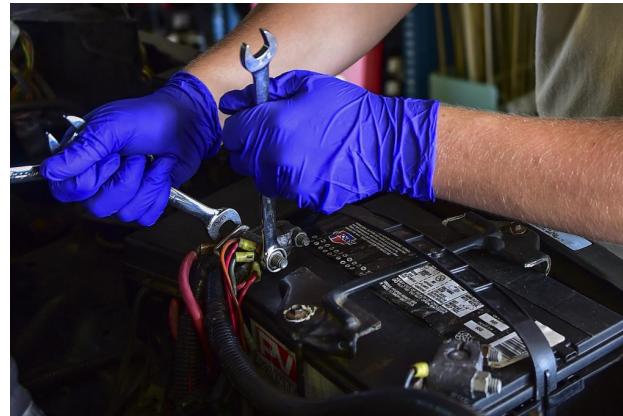
YALOYALO 41: Ni wasei na kena isau, e lailai na icolacola vakailavo⁵⁴



4.3 Cakacaka vata, taukeni vata – igu nuitaki

Me vaka e kilai levu, eda cakacaka vata ni caka na solevu se dua noda vulagi dokai. Na votai ni cakacaka e vakatau se soqo cava, kei na lewā nei turaganikoro. Na dui qaravi itavi vaqo sa dede noda muria tiko. O ira na noda marama, me vaka nira okati me ligi ni veiqravu, dau nodra na icolacola levu, qo e dua na ka me nanumi ni cakacakataki na sasaga ni ivurevure tudei.

YALOYALO 42: Rawarawa na qarava nida le levu⁵⁵



4.4 Yaga Vakailavo

Noda sasaga lelevu ni ivurevure tudei e yaga talega vakailavo vei keda. E rawa nida vakaduri bisinisi me rawa kina noda ilavo, me vakailavotaki kina na sasaga tale eso me vaka na tara vale vakoro, valeniwai se rumunivuli, se veivuke vei ira na wekada.

53 IVurevure: Mohammed Tazil, GGGI

54 Windpower Engineering & Development, August 2019, <https://www.windpowerengineering.com/pattern-energy-confirms-third-party-interest-in-company/>

55 IVurevure: ProCar Reviews.com, <https://procarreviews.com/wp-content/uploads/Removing-Car-Battery-1024x682.jpg>

YALOYALO 43: Na ilavo e rawa ena sasaga ni ivurevure tudei e rawa kina na vakacoko⁵⁶



YALOYALO 44: Kena vakacacani na baravi e vu sara mai na kena vakayagataki vakailoa na bukabulu, ni katakata kina o vuravura⁵⁷



4.5 Community Responsibility

O keda na lewe ni Pasifika e dredre vei keda na vanua kei na waitui. Eda veivolekati sara kei na veikabula. E sega ni bau milamila vei keda nida sa vakacacana tiko na veikabula – e vanua se waitui – ena noda vakayagataka na bukabulu? Sa noda itavi meda muduka noda vakacacana noda itikotiko kei na kena iyaubula, ena noda yalana na vakayagataki bukabulu.

Volavola:

56 IVurevure: ABC News, March 2016, <https://www.abc.net.au/news/2016-03-21/fiji-extends-state-of-disaster-in-wake-of-cyclone-winston/7264482?nw=0>

57 WikiVisually, https://wikivisually.com/wiki/Eita,_Kiribati

IVAKADRE 7

Veivosakitaka vakaiwasewase:

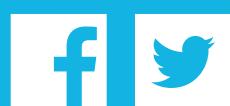
1. Cava so na yaga ni ivurevure tudei vei keda vakoro se vakaitikotiko?

2. E nomuni itavi vakoro na tarova se vakamamadataka na draki veisau?

Veivosaki kei na Taro



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