Aurora Pacific Economic Zone (APECO)

GATEWAY TO THE PACIFIC

Be a Part of Philippines Green Vibrant Economy

5P for RES

Prague - **P**roject - **P**ortfolio - **P**lanning - **P**latform

for Renewable Energy Sources

Self-Powered Community Business Knowledge Transfer

ČKD ENERGY
ČLEN SKUPINY ČKD GROUP

BRESSON

EC

HVM PLASMA

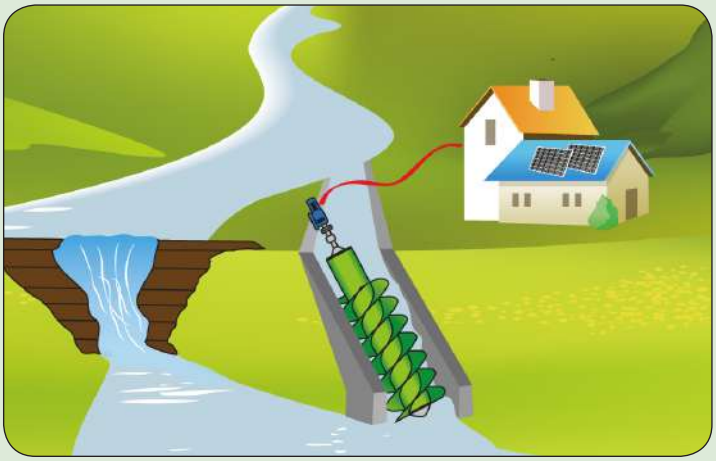
MADRY

CREA

Water energy

Screw Turbine 5 - 500 kWe; Suitable solution for streams and rivers in valleys with gentle gradient of the water flow

- Water gradient 1 - 10 m
- Water flow 0.1 - 10 m^3/s
- Friendly to water environment
- Demanding on construction work (water drive)



Micro hydro-turbine for SPC (Heinik, Francis, Kaplan,) 5 - 500 kWe; suitable solution for streams and rivers with varying and substantial gradient of water flow

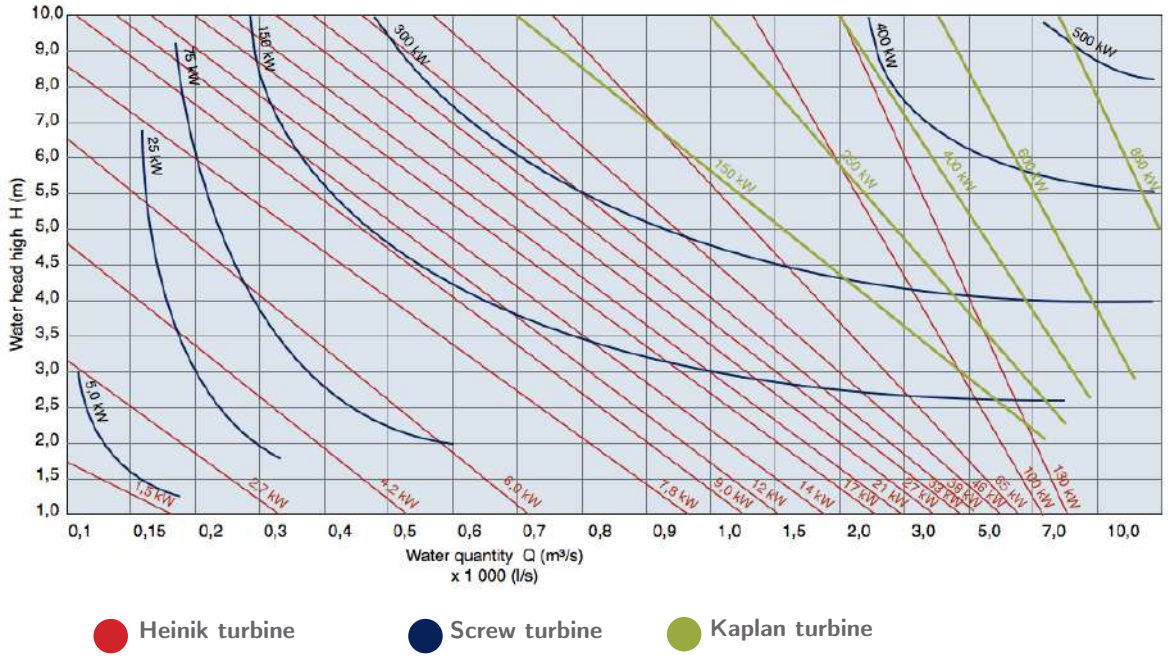
- Water gradient about 10 m
- Water flow 0.1 - 10 m^3/s
- Small and effective solution
- Demanding construction work (weir or dam).

Mini hydro-turbine for SPC (Heinik, Francis, Kaplan,) more than 500 kWe; suitable solution for rivers with more abundant water flow. Effective solution to water dams.

- Water gradient more than 10 m
- Water flow more than10 m^3/s
- Effective solution for water retention
- Demanding construction work (dam)

Water pumping hydro-plants and raining water retention.

Solution connecting several functions of water and potential of hydro-power and solar power. All known principles of hydro-dynamics and hydro-power technology are applied here in order to strengthen stability of electric power grid supply. For example, authors of APECO project should already start preparatory work to take advantage of the suitable landscape of the industrial zone to develop a comprehensive solution for regulation of dynamically growing demand for electric power and water.



The range of use of turbines for SPC (Heinik, Screw, Kaplan)

The chart gives the basic overview of hydro-power potential for SPC. It represents a quick orientation in searching for the relation between the required output of hydro-power (in kWe) and the potential of the given site with energy potential of the nearby water flow (m^3/s or m of gradient). The basic information from the chart and from hydrology, geography, and geology of the given site might allow for arriving to the costs necessary for implementation of such project (in USD) and arriving to an economic characteristic of building and operating such project (in USD/1 KWh.)

Examples of application

We selected examples from the Czech Republic demonstrating feasibility and return on investment of the above-mentioned hydro-power technology. (web. Štěchovice, Dlouhé stráně, Gess, HVM Plasma, CREA)

Solar energy

Small Solar Power (SPP) plants for mixed RES solutions

With output capacity:

- About 100 kWe (thin film technology is recommended)
- Less than 1 MWe (standard PV products on the market can be used)

Suitable for mixed application (biomass, hydro-power, wind, thermal and other renewable energy sources) for communities away from central power grid. These are standard solutions, now commonly used (PV panels, converters, structure.)

Solar Generators (SG) for building (thin film technology is recommended)

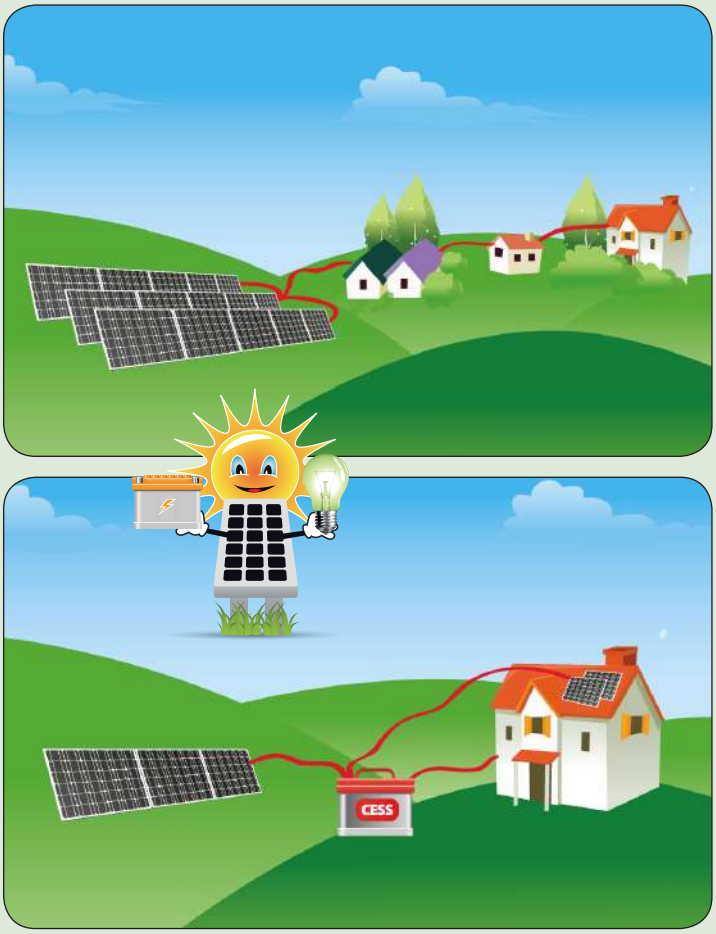
- About 10 kWe
- Less than 100 kWe

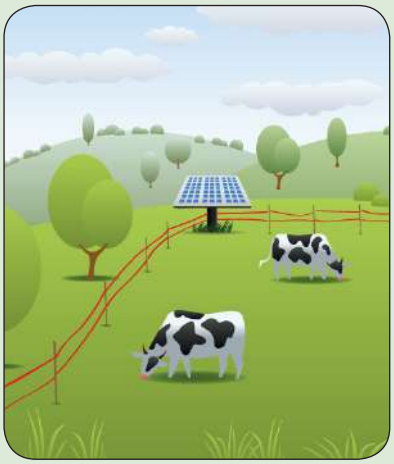
Suitable for use of PV solar thermal panels on roofs of houses allowing for use of electric power as well as hot water. This solution is focused on households (residential real estate) and smaller free-standing communal facilities (schools, hospitals and other communal service facilities). Hybrid panels for generation of electric power and heat are under development.

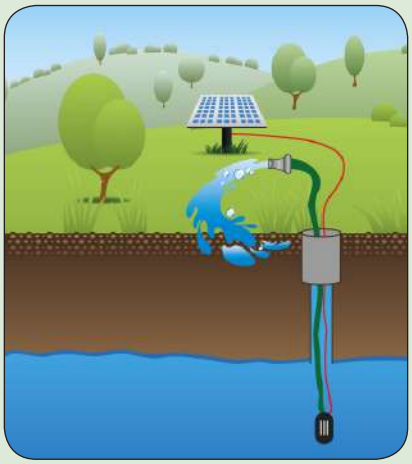
Solar Generators (SG) for other applications: less than 10 kWe (thin film technology recommended)

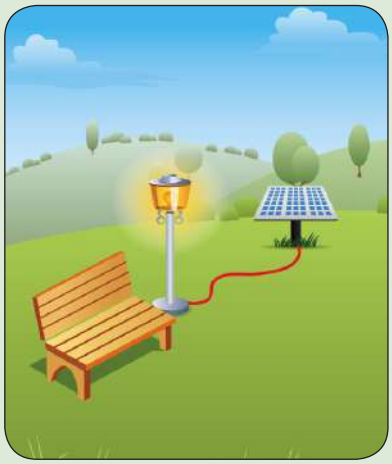
- Agriculture needs (e.g. simple lanterns, SG fence for livestock)
- Water pumping (SG pumps for drinking, supply water)
- Public lighting (SG streets lights, public places, market, etc.)

Suitable everywhere where is a sun shine and storage of electric power is available and environmentally acceptable (i.e. suitable type of batteries.) Given examples indicate the great variety of existing use of SG for rural and urban settlements anywhere in the world.





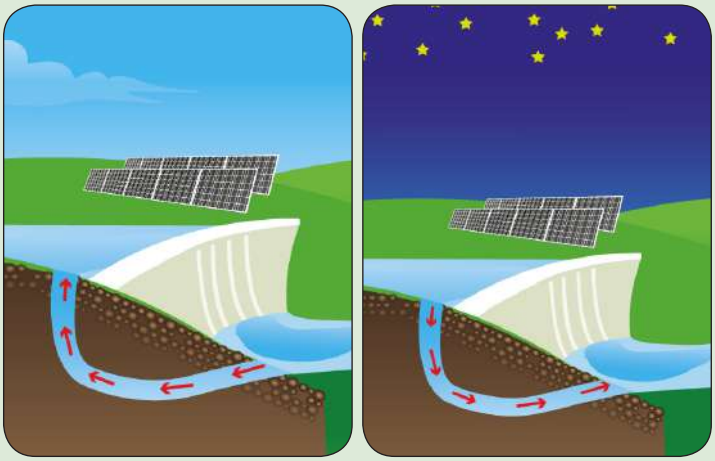




Storage (aaccumulation) of electric power by using photovoltaic and hydro-power technology:

- Output of about 100 kWe (simple earthfill dams retaining water for power generation during night).
- Output about 1 MWe (small concrete dams with water retention for power generation during night and other functions: drinking water supply, water for irrigation, etc.)

Suitable for any location with sun shine and the landscape allowing for building economically feasible facility for water retention. Water is pumped up into the higher water reservoir during daytime (when PV-generated electricity is available) and during night is using its kinetic energy to generate electricity as it is released back into the lower water reservoir.



Biomass energy

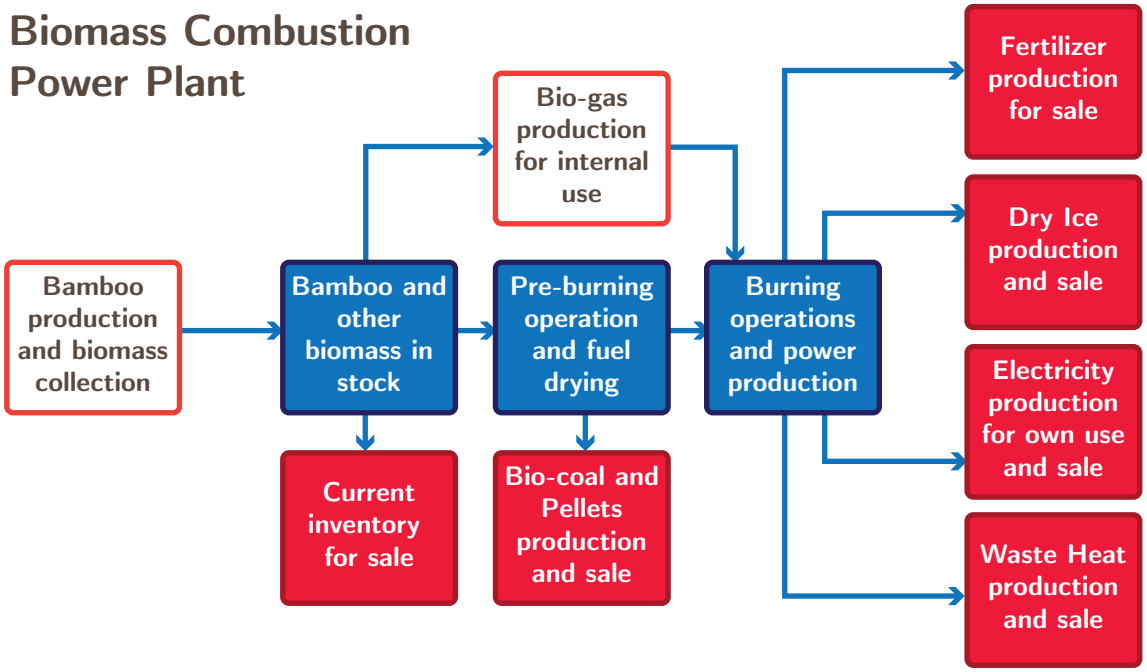
Bioenergy is renewable energy obtained material derived from biological sources. They include biomass, i.e. biological material used as a biofuel for conversion into energy (primary on into steam and then to generate electricity). For the APECO project we are taping the knowledge and skills of energy sector of Czech Republic's industrial base and the knowledge and skills of Philippine partners in growing and using bamboo to generate electricity.

In cooperation with our local partner, Asia Pacific Resources Recovery Reuse and Development Corporation (APRRRDC) we offer delivery of services and technology for decentralized electrification of the area with electric power generating units based on renewable energy sources providing electric power 24/7, year around. The solution is built on using fast-growing biomass – bamboo and its conversion into steam and electric power.

Use of bamboo for the proposed industrial zone APECO. This is not a conversion of bamboo into electric power generation. With the potential of getting up to 4 000 metric tons of biomass from 100 hectares we propose to design the bamboo-growing fields in the way that the top quality bamboo is sold by SPC Utility as construction material and them as material for making furniture and the rest to be used for generating steam and electric power.

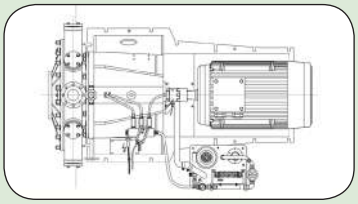
We propose to use our technical assistance for transfer of the best practices within the SPC Concept, SPC Model, and SPC Project, training of local technicians and managers, preparation of certification and accreditation programs, and implementation of control system and sustainability of operation of technology that we deliver.

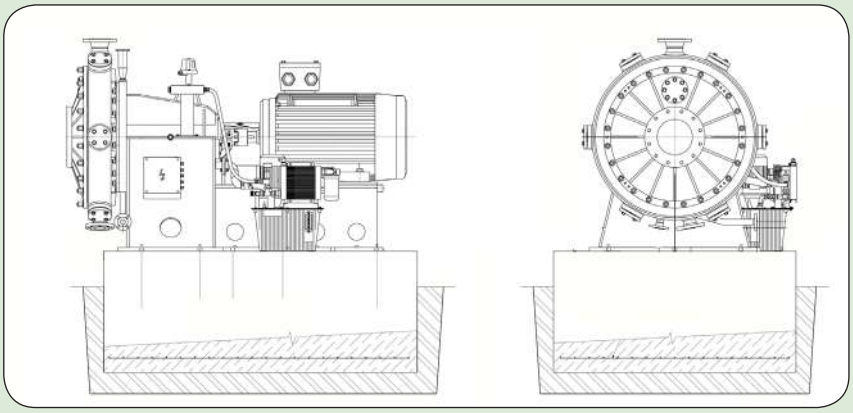
Biomass Combustion Power Plant



Examples of application

We selected examples from the Czech Republic illustrating feasibility and economic return on investment of the above technology using biomass in production of energy (web. CKD, Madry, Bensson, Enco Group)





Mixed energy

In cooperation with our local partner, the APRRRDC, we offer delivery of technology and services for decentralized electrification of APECO industrial zone with electric power--generating units using renewable sources of energy, 24/7, year around.

We offer cooperation in building energetically independent systems (micro/mini grids) for distribution and sale of electricity that will satisfy demand in the place of its use, enter the environment in a sensible manner and respect the character of the landscape (i.e. small power-generating units) using locally available sources (biomass, solar power, hydro-power) to generate electricity and create jobs both during the construction as well as for operation of the system.

For building micro/mini grids we offer delivery of power-generating units in configurations (biomass, solar power, hydro-power) reflecting the final proposal for electrification of the APECO industrial zone. We are interested in working on preparation of the proposal with participation of Czech experts in a team which would be for this purpose created by APECO. We offer technical assistance with preparation of the logistics of project implementation, testing, and bringing the entire system into operation. We expect that the majority of elements (poles, lines, electricity meter, etc.) will be delivered from local suppliers.

Examples of applications (W, B, S) are presented by individual illustrations and technical description is presented in detail in technical report.

Due the general character of assignment concerning electrification of the APECO industrial zone and for sufficiently detailed offer we created a SPC Model of combination of electric power sources and micro/mini grids for the entire area. The Model is following two major criteria:

a) Dispersion of absorption capacity of end users reflecting the excepted demand for electricity

b) Management of expected risks related to fulfillment of financial obligations raised by using delivery of electric power.

We are aware of the fact that the offer of technologies (W, B, S) is not exhaustive. Other possibilities also exist, for example wind and geothermal power plants. If the SPC Concept will prove itself - as we believe - to be the optimum solution for APECO decentralized electrification needs we would be looking forward more detailed requirements APECO might have and at the same time we would be looking forward to work with other partners on implementation of electrification of the entire area and the total electric power output of the 2 to 3 MWe throughout the system.

What we are offering:

The logistics and marketing material prepared in cooperation with our strategic partner in the Philippines, the APRRRDC.

Technical report concerning the technology which is being offered for decentralized electrification of the APECO zone over the next five years.

If our approach to solution of electrification of the APECO would be of your interest we are ready –after we get more detailed inputs – prepare in desired detail individual parts of our offer.

SPC Concept works within the logic of an open building blocks of electric power-generating units and distribution systems with the overall capacity given in the range between 2 to 3 MWe. Using the SPC Model we propose for further discussions concerning electrification and industrial development of APECO zone the following configuration:

One source with the output of 1,400 kWe (B: 1200 kWe, S: 100 kWe, W: 100 kWe),

Three sources of 100 kWe each in pair combinations of B/S/W, and

One source of 500 kWe in any combination of B/S/W. The total power output of 1.5 MWe.

In the SPC Model we assume inputs from other companies, especially from Asia.

Another aspect to strengthen trustworthiness of development of the zone to investors is creation of new jobs (bamboo as a contraction material, material for furniture making, production of charcoal and briquettes, etc.) In this contexts we present – together with our partner, the APRRRDC, the idea of building SPC Utilities which would rise along implementation of this project and then assume the responsibilities for development (revenues and expenses) of electric power supplies and management for the entire APECO industrial zone's energy needs. Guarantees related to payment for delivered and used electricity are the best signal for any investor (including banks) to participate in project financing.

SPC Concept financing model is based on Revolving Funding mechanism