SUMMARY

[002a] According to a first aspect, there is provided a method for generating electrical power comprising: processing a first energy source to produce electricity via a coupled generator, a first exhaust combusted gas, and a by-product first steam flow via a coupled heat recovery steam generator; processing a biomass fuel source, separately from the processing of the first energy source and the first exhaust combusted gas, to produce a second steam flow at matched temperature and pressure conditions to the by-product first steam flow, wherein the biomass fuel source is different than the first energy source and the matched temperature and pressure conditions are adjustable based on temperature and pressure conditions for the by-product first steam flow or the second steam flow; combining the by-product first steam flow and the second steam flow, wherein the steam flows are combined after the by-product first steam flow is processed through the heat recovery steam generator and the combined steam flow is at or below a maximum flow of the by-product first steam flow produced from the first energy source via the coupled heat recovery steam generator; and routing the combined steam flow through a steam turbine generator.

[002b] According to a second aspect, there is provided a method for generating electrical power comprising: processing a first energy source to produce electricity via a coupled generator, a first exhaust combusted gas, and a by-product first steam flow via a coupled heat recovery steam generator; processing a biomass fuel source, separately from the processing of the first energy source and the first exhaust combusted gas, to produce a second steam flow at matched temperature and pressure conditions to the by-product first steam flow and the matched temperature and pressure conditions are adjustable based on temperature and pressure conditions for the by-product first steam flow or the second steam flow, wherein the biomass fuel source is different than the first energy source; combining the by-product first steam flow and the second steam flow, wherein the steam flows are combined after the by-product first steam flow is processed through the heat recovery steam generator and the combined steam flow is at or below a maximum flow of the by-product first steam flow produced from the first energy source via the coupled heat recovery steam generator; routing the combined steam flow through a steam turbine generator; collecting water at a condenser; reheating the water; and using the reheated water for the processing of the first energy source and the biomass fuel source.

[002c] According to a third aspect, there is provided a system for generating electricity comprising: a first component for producing, from a first energy source, electricity via a coupled generator, a first exhaust combusted gas, and a by-product first steam flow; a second component for producing, separately from the processing of the first energy source and the first exhaust combusted gas, a second steam flow from a biomass fuel source at matched temperature and pressure conditions to the by-product first steam flow, wherein the biomass fuel source is different than the first energy source and the matched temperature and pressure conditions are adjustable based on temperature and pressure conditions for the by-product first steam flow or the second steam flow; a heat recovery steam generator for processing the by-product first steam flow; a steam line which combines the by-product first and second steam flows after the by-product first steam flow is processed in the heat recovery steam generator and the combined steam flow is at or below a maximum flow of the by-product first steam flow produced from the first energy source; and a steam turbine generator which extracts energy from the combined steam flow.

[003] The present disclosure is also directed to systems and methods for power generation through the combination of a biomass fuel combustion cycle and a natural gas or other fossil fuel fired cycle. In general, the hybrid cycle format utilizes the steam from the biomass boiler with the steam output from a traditional natural gas or fossil fuel fired power plant. In alternative embodiments, the steam from the biomass boiler can be combined with the steam output from a solid fuels boiler. Inefficiencies of a traditional biomass power plant are overcome through this combination.

[004] The process for the generation of steam from the two sources is kept separate. Steam from the biomass source is combined with steam from the natural gas, other fossil fuel cycle, or solid fuel cycle and flows to a common steam turbine generator. Exemplary embodiments of the present disclosure will now be described.

[005] In a first exemplary embodiment, an unfired 3 drum heat recovery steam generator (HRSG) is used. The combined steam flows are passed through the high pressure section of the steam turbine generator. When the plant is operating in hybrid mode with both the fossil fueled and biomass fired boilers in operation, the combined steam flow leaving the high pressure section of the steam turbine generator is routed along steam lines to two destinations. First, a portion of the steam is routed along a cold reheat steam line to the reheat section of the HRSG. The steam from the power production cycle is reheated in the HRSG. Upon exiting the reheat section of the HRSG, this reheated steam is combined with steam from the intermediate pressure drum of the HRSG. Second, a portion of the steam flow leaving the high pressure section of the steam turbine is routed along a cold reheat steam line to be reheated in the reheat section in the biomass boiler. The outputs from the reheat section of the HRSG, the intermediate pressure drum of the HRSG, and the biomass boiler reheater