Update on the operational experience of the H-class power plants fleet, including South Korea’s first commercial unit “Dangjin3”

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Abstract

The first deployment of Siemens’ new path-breaking 50 Hz H-class gas turbine and combined cycle technology was in Europe with the Ulrich Hartmann power station (Irsching unit #4). This plant achieved several technology milestones and holds the world record for highest efficiency, achieved with an internally fully air cooled engine. Besides this world record efficiency the high degree of operational flexibility in terms of fast cycling, grid support, daily start stop and load following per load dispatch sparked the interest of the power generation community.

The commercial operation started successfully on time in summer 2011. Ever since, the H-class power plants fleet has rapidly increased its footprint from Asia over Europe to the United States. Especially in Florida (United States) and South Korea the first 60Hz units were sold and four of them started commercial operation in 2013.

This paper will provide a detailed update on the H-class fleet experience and will mainly focus on South Korea’s first H-class unit in operation at the LNG-fuelled Bugok site of GS EPS (Electric Power and Services) Ltd. With ignition and first fire in spring 2013 Siemens H-class technology officially starts its operation in the Asian Pacific Region.

The 60 Hz Dangjin 3 formerly known as Bugok 3 plant incorporates some of the most advanced features available today in combined cycle technology, producing over 415 MW on one shaft. The plant is capable of a net efficiency of over 60% (LHV basis), with very advanced steam conditions. At the same time it has immense operational flexibility, able to hot start in less than 30 minutes (hot start “on the fly” conditions), to deload very quickly and also to provide excellent frequency response capabilities.

This paper will highlight some of the plant design components and features and will show how optimal balance between capital costs, plant performance and operation & maintenance factors is achieved in commercial operation.
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1. Introduction

Korea has few indigenous energy resources, and in order to sustain its high level of economic growth, it must import large quantities of energy products. For example, the country imported 86 percent of its primary energy supply in 2009 on a net basis.

According to the EIA, South Korea was the world's tenth-largest energy consumer in 2011 and is one of the top energy importers in the world. In 2011 the country was the second-largest importer of liquefied natural gas (LNG), the third-largest importer of coal, and the fifth-largest importer of crude oil. South Korea has no international oil or natural gas pipelines, and relies exclusively on tanker shipments of LNG and crude oil.

Electricity consumption increased steadily over the last decade, and in December 2012 Korea’s peak power demand surged to a record 75,987 MW. Due to its climate, the peak demands in Korea occur in winter for heating and summer for air-conditioning. New construction of power generation plants cannot keep pace, and therefore – according to the Korea Energy Economics Institute – this peak demand needs to be met with an installed generating capacity of 81,806 MW. This is well below the industry's normal reserve generation buffer of 10 percent and dangerously near the country’s 4,000-MW safety threshold. The power reserve rate has been in steady decline, from 17.1 percent in 2003 to 10.5 percent in 2006, and 7.9 percent in 2009 to 5.5 percent last year.

Meanwhile, measures have been introduced to increase the reserve margin to 22 percent of the total capacity by 2027. In 2011-2012, the construction of about nine GW of gas-fired power plants was begun. In addition, the government’s plan issued on January 31, 2013, includes the construction by 2027 of thermal power plants fuelled by coal and liquefied natural gas (LNG) with a total capacity of 15,800 MW. Renewable energy sources, especially wind, are also targeted to generate 12 percent of Korea’s total electricity supplies by 2027 – almost double the level of seven percent previously budgeted.
The state-owned Korea Electric Power Corporation (KEPCO) is responsible for electricity generation, retail, transmission, and distribution. The Korea Electric Power Exchange (KPX), established in 2001 as part of the electricity sector reform efforts, serves as the system operator and coordinates the wholesale electric power market. KPX regulates the cost-based bidding-pool market and determines the prices of power sold between generators and the KEPCO grid.

On the power generation side, independent power producers (IPP) play an increasingly important role. Their primary fuel of choice has so far been LNG. Given the increasing share of renewables, in the future gas will also remain the fuel of choice because gas-fired combined cycle power plants unite the highest fuel efficiency with the lowest emissions of CO2 and NOx per produced kWh, the highest operating flexibility, the lowest investment costs per installed kW, and a comparably small footprint.

Due to Korea’s dependence on LNG imports as their sole source of this fuel, gas prices are high, emphasizing fuel efficiency. Gas turbine manufacturers have reacted to this demand by developing larger and more efficient gas turbines like the SGT6-8000H, which has been designed for efficiency and the highest operational flexibility. In addition to the gas turbine, the bottoming cycle – that is, the heat-recovery steam generator (HRSG) and the steam turbine – have the potential for higher efficiency and flexibility. Siemens has therefore increased the live steam temperature to 600 °C Celsius and introduced the Benson® HRSG.

Another means to increase the utilization of the energy contained in fuels are cogeneration plants, which are power plants that produce electricity and heat or steam for domestic use (heating) and industry (process steam). With these plants, fuel utilization rates of more than 80 percent can be achieved. Combined heat and power (CHP) plants in particular are becoming more and more important.
2. Siemens H-class

2.1. H-class portfolio and core engine design

Following the merger of Westinghouse Power Generation with Siemens in 1998, the decision was made to develop a Next Generation Family of Gas Turbines and therewith widen the existing product portfolio based on the H-class frames for 50Hz and 60Hz markets (Figure 1). The SGT-8000H series addresses the major market requirements in terms of efficiency, environmental protection, operational flexibility and economical value.

![Figure 1: Siemens GT portfolio](Image)

The SGT-8000H gas turbine series combines the best design features and technologies of the established product lines adding several technology innovations and enhancements and is the result of continuous optimization and harmonization development activities (Figure 2).
Figure 2: Main features of SGT-8000H gas turbine series

The functional and mechanical design of the engine was built on the extensive experience gathered over decades with the predecessor 50Hz and 60Hz engines of both companies Siemens and former Westinghouse. Proven design features were applied wherever possible, and “Design for Six Sigma” tools were used throughout the process, to deliver a robust product which meets all requirements. The results of the SGT-8000H frame development, testing and validation activities were also used as an enabler for the different F class engines upgrades.

Based on the SGT-8000H frames different packages and plant product configurations for both 50Hz and 60Hz markets were developed (Figure 3). Providing single-shaft and multi-shaft solutions covering an application range up to three gas turbines on a single steam turbine ensures a flexible and perfect fit to the customer requirements in terms of power demand, specific cost and in special cases a limitation regarding footprint, early power production and transportation issues. These
configurations are of course suited to particular applications like e.g. Combined Heat and Power.

![Figure 3: Available package and plant configurations for SCC-8000H series](image)

### 2.2. SCC-8000H combined cycle power plant solutions

Siemens Energy offers different combined cycle power plant configurations based on single- and multi-shaft arrangements. Additionally Siemens is unique in offering a flexible scope of supply varying between entire power plant (turnkey scope) over power block / power island and up to an extended power train. This enables Siemens to support – depending on the project specific setup – the regional partners and local knowledge. The portfolio flexibility with regards to different arrangements and scope of supply allows a wide range of technical and commercial (risk and cost) optimizations (Figure 4).
The power plant SCC-8000H series was developed based on the SGT-8000H as prime mover, the Irshing test plant and the large F-class experience. The design principle comprising the gas turbine, the generator, the coupling and the steam turbine on a single-shaft remained the same, as this continues to offer the customer the greatest economy and at the same time supreme operational and financial flexibility. The SCC-8000H series is also characterized by its high degree of harmonization, modularization and compact design towards footprint and space requirements (Figure 5). Both solutions for 50Hz and 60Hz markets are based on the same design principles.

The H-class power plant solutions portfolio is using a triple pressure reheat water-steam cycle as standard design with live steam parameters up to 600°C / 170bar and Benson® boiler technology. Application of lower steam parameters and drum type Heat Recovery Steam Generators (HRSG) is also possible. The project specific selection of major design parameters and components is always a result of an
overall life cycle cost optimization, which comprises invest, efficiency and operational flexibility aspects allowing maximization of customer’s value add and investment security. Siemens is offering a wide and flexible H-class combined cycle power plant portfolio based on pre-designed and pre-optimized solutions, which provide an answer to the leading market requirements.

**Figure 5: Reference power plant design of the H-class single shaft**

The outstanding efficiency level achieved by the SCC-8000H series is based on a proven technology, where two major levers are brought together and harmonized from an overall power plant solution point of view (Figure 6):

1. Use of the H-class gas turbine technology with its increased pressure ratio, increased turbine inlet temperature, optimized air cooling and advanced components design
2. Use of an advanced water-steam cycle (up to 600°C) and fuel preheating up to 215°C
The Siemens H-class power plants were designed from the very beginning with a strong focus on highest level of operational flexibility. The design challenge was to provide improved plant flexibility without compromising plant service life or plant efficiency. Very early during the 8000H program a key design decision was made to select from both inhouse available gas turbine cooling technologies (air and air/steam) purely internal air-cooling. Due to the heavy impact of the steam cooling on the engine operational flexibility and design complexity, the internally fully air-cooled design was selected for the SGT-8000H series. This design feature enables faster starts, since there is no need to wait for steam from the water/steam cycle. The avoidance of steam cooling and external coolers enables easier simple cycle and bypass operation, faster load following and part load operation. Design simplicity especially in terms of sealing designs provides higher engine robustness. The SGT-8000H proven design allows achieving outstanding performance and operational flexibility without the higher risk associated with the steam cooling.
Considering the overall plant operational flexibility it becomes essential to follow a holistic approach, where each and every single plant component – beyond the gas turbine – needs to be optimized accordingly. Of course the choice of the gas turbine technology is the first prerequisite for a flexible plant operation, nevertheless the flexibility “performance” in this regard will be limited by other components, if not designed to support for example fastest startups. Therefore and as shown in Figure 7 Siemens Energy Solutions having all major components and technologies inhouse is able to provide a complete integrated system, which at the same time fulfills reliability, efficiency and flexibility requirements.

![Integrated approach](image)

**Integrated approach**

**FACY™ as the outcome of an integrated approach**

- **Optimization Criteria**
  - Thermal stress optimization
  - Load Ramp
  - Start-up readiness

- **Integrated Plant design**
  - SIEMENS
  - GT
  - HRSG
  - ST
  - BOP
  - Start-up procedure
  - Control system
  - Condensers
  - Auxiliaries

- **Market Boundaries**
  - Flexibility
  - Environment
  - Profitability

**FACY enables the world’s fastest start-up times without additional life time consumption**

Figure 7: SCC-8000H series using FACY™ as a result of a fully integrated plant approach for highest operational flexibility

The implementation of the FACY™ concept in combination with the hot start on-the-fly allows a hot start-up time reduction down to less than 30 minutes in comparison to “conventional” hot starts. The concept is based on a procedure for parallel start-up of gas and steam turbines, while monitoring and controlling the temperature gradients within limits acceptable for all critical plant components. Further, the design
is based on a long term operation experience with different steam conditions in the Siemens turbine design. A new start-up sequence, which avoids gas turbine load hold points, was implemented. The main innovation here is the early steam turbine starting point with earlier acceleration and loading of the turbine. The FACY™ technology allows for higher number of starts and faster cycling without compromising plant lifetime consumption.

Figure 8: SCC-8000H series combines advanced water-steam cycle design with FACY™ technology for a perfect match between highest efficiency and plant operational flexibility

As H-class gas turbines provide high exhaust temperatures >620 °C, a further efficiency increase was achieved based on an advanced three pressure reheat water steam cycle (up to 600°C inlet temperature and 170 bars inlet pressure). Despite high live steam parameters, the plant flexibility is further improved by use of a BENSON® type HRSG and condensate polishing. Compared to other combined cycle power plants using gas turbine steam cooling, the number of main and auxiliary systems and their complexity are kept extremetly low and therefore even the plant footprint could be reduced to the minimum (Figure 8).
The Benson®-type HRSG for high steam parameters is designed and engineered by Siemens. As this component is of major importance for boosting efficiency and flexibility, the decision was taken to develop and build it in-house on the basis of the available F-class experience with previous Benson® boilers, such as in the projects Karstoe, Simmering and Timelkam (Europe). Due to the increased thermal cycle parameters, advanced high temperature materials known from the 600 °C steam power plant technology were used for the HRSG design. For both design standards DIN and ASME Siemens Energy provides solutions with proven materials for up to 600°C water / steam cycles and is the unique OEM with extensive operational experience (e.g. “Ulrich Hartmann”, Figure 9). The design of the HRSG high temperature materials are based on the following considerations:

- Sufficient creep strength behavior at design temperature (stable microstructure)
- Acceptable resistance to steam side oxidation
- Sufficient fatigue characteristics to withstand extremely high thermal cycling
- Acceptable cost

Depending on the plant economics, main steam parameters for 50Hz and 60Hz may be decreased to 150bar and 585°C to enable e.g. the use of a drum type HRSG.
Figure 9: Siemens HRSG design using live steam parameters up to 600 °C and 170 bar available according DIN and ASME design codes

The Siemens advanced cycle design is based on the operation of the condensate polishing plant to ensure the required feedwater purity for a once-through boiler and thus to keep the contamination of feedwater within the limits (for example according VGB or EPRI guidelines). The main advantages of condensate polishing are:

- Higher plant operational flexibility, for example through reduction of the waiting time for steam purity / quality (shorter startup times)
- Reduced corrosion risk, especially with increased steam side pressure
- Lower blow down rates (reduced loss of water and heat)
- Shorter commissioning time
- Contamination due to leakages is removed

**Cogeneration plant optimization**

The Combined Heat and Power (CHP) application is driven by the related process requirements, e.g. district heating or process steam extraction. Each CHP plant is customized in order to provide the highest benefit in terms of:
- Satisfying the process requirements as far as possible and avoid using back-up facilities or add-ons such as duct firing
- Reaching a high fuel utilization factor (a value above 80% is an indication for a good CHP-quality)
- Minimizing the power loss factor, which provides an indication about the quantity of electricity “lost” due to the extracted steam not taking part in the electricity generation process

Therefore Siemens Energy Solutions single shaft design is also optimized for CHP applications. Despite the compact design with the floor mounted turbine generator train, it’s possible to provide up to a three stage steam extraction for heating purposes or process steam. Figure 10 shows the possible heat extraction interfaces in the SCC-8000H 1S series. The use of the innovative multiple steam extraction design enables the increase of the fuel utilization level up to >85% and allows a fine tuning according different customer load cases and therefore higher operational and economical flexibility.

Figure 10: Steam extraction interfaces according SCC-8000H 1S

Reference plant design of the SCC-8000H offers several heat extraction interfaces and is flexible for project specific customization

Fuel utilization factor ca. 85% (based on 270 MWth district heating)
3. Fleet experience

3.1. References of the SCC-8000H series

With the successful conclusion of “Ulrich Hartmann” plant in Irsching (unit #4) and the related validation and testing phases, Siemens Energy is the first OEM to hand-over a gas turbine engine and a combined cycle plant with efficiency far beyond 60%. Siemens impressively demonstrated that world-record technology is now world wide commercially available to customers.

The next commercial success was achieved in Florida, USA, where 9 units of the SGT6-8000H were placed. All Florida Power & Light sites in Cape Canaveral (all three engines are already in commercial operation), Riviera Beach, and Port Everglades are equipped with the SGT6-8000H gas turbines in a multi-shaft configuration (3 on 1) and provide approximately 1200 MW electrical energy each (Figure 11). Prior to shipment to first customer’s site (Cape Caneveral) the full scale 60Hz engine was thoroughly tested in the Berlin test facility. Even with Siemens’ risk minimizing validation approach, Cape Canaveral achieved with the first three 60Hz new engines commercial operation five weeks ahead of schedule. This in turn lead to a higher customer satisfaction and additional financial benefits.

At the same time period the next order from South Korea for the supply of a complete combined cycle power plant equipped with the SGT6-8000H in a single shaft configuration was placed by the independent power producer GS Electric Power & Services, Ltd. As a consortium leader, Siemens installed the 400MW class power plant Dangjin 3 as a turnkey project (will be discussed in next chapter). In 2012 and 2013 further seven units were successfully sold in South Korea, with Ansan as a multi-shaft configuration, Andong, Posco Power 2 as a single shaft arrangement and Daegu City as a single shaft with a CHP application.
Following the success in Asia Siemens Energy has received an order for turnkey erection of the Lausward combined cycle power plant with district heat extraction in Düsseldorf, Germany. The order was placed by Stadtwerke Düsseldorf AG (SWD). With an electrical unit output of around 600 MW and a net efficiency of over 61% as a single shaft arrangement, the Lausward CCPP will set an amazing number of three new world records. Never before has it been possible to extract 300 MWth of district heat from a single power plant unit in combined cycle operation (which is approximately 75% of the maximum district heating demand of the city of Düsseldorf). Thus, the overall efficiency of the natural gas fuel will be around 85 percent. The Lausward CCPP plant will be one of the most efficient and environmentally sustainable plants in the world (Figure 12).

Further contract awards were recently achieved in the US in Pennsylvania with Moxie Liberty as a double unit single shaft SCC6-8000H 1S, in Turkey a 50Hz single shaft unit and in Malaysia also with a double single shaft unit in Prai. Currently
several projects are in final negoceation steps, confirming the world wide acceptance of the SCC-8000H power plants and customer’s trust in this proven technology.

**Figure 12: Combined cycle power plant Lausward in Düsseldorf, Germany**

### 3.2. Dangjin 3: Asia’s most efficient CCPP

GS EPS – Korea’s first independent power producer – was founded in 1996 as a subsidiary of LG E&C. In October 1997, GS EPS awarded the contract for their first project to Siemens for a new power plant at their site in Dangjin, about 100 kilometers south of Seoul. This plant, now called the Dangjin 1 project, was a first pioneering step. It was one of the first plants in Korea to feature F-Class gas turbines and the first in Korea to use the Siemens V84.3A (today known as SGT6-4000F). The engine is constructed on proven Siemens design principles but has several new features, including an annular combustion system with specially designed burners that increase efficiency while significantly reducing emissions. At the time of its
commissioning in 2000, Dangjin 1 became the most efficient power plant in Korea. In 2006, GS EPS awarded Siemens a follow-up order for an extension of the Bugok site, the Dangjin 2 project. This power plant, featuring the same SGT6-4000F gas turbine, was supplied on a turnkey basis in collaboration with GS E&C as a consortium partner. The installation and commissioning were completed one month ahead of schedule in February 2008, after a total construction period of nearly 26 months. The CCPP – in a “2+1” multi-shaft arrangement with a net capacity of 565 MW and a net efficiency of 58.6 percent – became the most efficient and environment-friendly power plant in Korea.

Continuing its story of innovation in Dangjin, GS EPS and Siemens partnered again in March 2010 in a joint project to bring the latest technology to Korea. In collaboration with GS E&C, Siemens supplied a complete turnkey H-Class single-shaft combined cycle plant for Dangjin 3 (Figure 13). Siemens introduced an LNG-fired single-shaft plant concept to the Korean energy market for the first time. The contract was signed on January 11, 2011, and the ground-breaking ceremony for the new project – which represents an investment of about 460 billion won ($420 million) – was held on April 19, 2011. The 415 MW-rated (gross) lighthouse power plant went into commercial operation in August 2013 – again ahead of schedule. Project execution excellence is a further proof for Siemens Energy Solutions’ know-how and high quality standards. Our customer’s acknowledgement as a reliable and trustful partner is our foundation for a longer lasting fruitful collaboration.

With Dangjin 3 commissioned, Siemens once again brought the title of Asia’s most efficient power plant to the Dangjin site. It broke the 60 percent efficiency barrier for the first time in Asia and the third time worldwide – after Germany’s Ulrich Hartmann project in June 2011 and the United States’ FPL Cape Canaveral power station, being commissioned in early 2013. All of them also powered by the Siemens 8000H series of gas turbines.
Figure 13: Dangjin 3 CCPP in Bugok site in Dangjin Province of South Korea

The turbine-generator package is shown in Figure 14, which provides a general view inside the turbine building. There, it becomes obvious how compact and simple the arrangement is. The total number of required auxiliary systems is minimized, since there are no additional interfaces required to the bottoming cycle (for GT cooling purposes) and because of the typical single shaft design having for example a common lube oil system for all 3 package components.

The scope of supply of Dangjin 3 includes the following main components:

- 60-Hz version of the Siemens H-Class gas turbine, which is a direct aerodynamic scaling from the 50-Hz version. The lead SGT6-8000H machine was installed and thoroughly tested on the Siemens test bed in Berlin between the summer of 2011 and the summer of 2012.
- SST6-5000 steam turbine with laterally installed condenser (sea water cooling), coupled to the generator by a synchro-self-shifting (SSS) clutch
- A standard hydrogen-cooled generator of the SGen6-2000H type for the steam and gas turbines
- Triple-pressure reheat heat-recovery steam generator with HP once-through (Benson\textsuperscript{®} type) boiler and natural circulation LP/IP boiler design, supplied as an indoor version within a boiler house
- The SPPA-T3000 plant control system with an operator station integrated in the existing control room
- Power control centres and electrical equipment such as isolated phase bus duct, generator circuit breaker, DC components and LV switchgear
- Main and auxiliary transformers
- New 345 kV grid connection employing GIS
- New LNG connection including new gas pressure governor station. The fuel gas is delivered from the KOGAS terminal point via LNG piping, gas filtering, metering and preheating equipment, to the gas turbine fuel gas skid. The gas pressure at the terminal point to the power plant is >40 bar(g)
- New cooling water structures
- New lifting and circulating water pumps
- Extension of ancillary systems such as demineralised water and chlorination plant

Figure 14: Dangjin 3 power train using SGT6-8000H in a single shaft arrangement
Annually, the Dangjin 3 unit will save more than three percent of its natural gas fuel per kilowatt hour compared to the already high end Dangjin 2 plant. Assuming operation at base load, this will result in savings of up to 20,000 cubic meters of natural gas per year. In comparison, a typical LNG tanker carries four to five tanks of LNG of approximately 35,000 cubic meters, this means Dangjin 3 will save one tank every two years, one complete LNG tanker load every eight years, or three LNG tanker loads over its projected 25-year economic lifespan. In terms of CO$_2$ emissions, combined cycle is already the leading fossil-fuel technology. As a result, the Dangjin 3 CCPP will be the fossil power plant with the lowest CO$_2$ emissions in Korea, conserving an additional 20,000 tons of CO$_2$ annually compared with Dangjin 2’s outstanding benchmark.
3.3. Operational experience

Since “Ulrich Hartmann” handover in July 2011, SCC5-8000H has achieved in the Irsching 4 power plant in sum more than 16,000 equivalent operating hours and more than 450 starts. The unit is running in a daily start / stop and load following mode according to the dispatcher requirements.

Several planned short time outages were performed and allowed a visual inspection of the hot gas path and confirmed the anticipated excellent engine conditions. The combustor inspection took place at 12,000 EOHs outage in May 2012. The engine conditions and the hot gas path components were found to be in excellent conditions. Further opportunistic inspections were done, the latest one in August 2013. The results are more than satisfying, as the engine and the overall plant components are in an excellent shape, confirming accordingly the expected lifetime prediction (Figure 15). The intensive monitoring of “Ulrich Hartmann” shows also outstanding plant availability and starting reliability, which is necessary for a daily cycling operating regime.

The overall SCC-8000H fleet has today by far exceeded 30.000 EOH and in 2015 the 250.000 EOH mark will be surpassed (Figure 16). In 2013 the first four 60Hz achieved commercial operation successfully and ahead of schedule. The units are running at base load and provide the fleet with very positive feedback in terms of performance and of course reliability and availability.
Figure 15: Ulrich Hartmann (Irsching unit #4) inspection summary

Figure 16: SCC-8000H fleet outlook
4. Summary

This paper provides an overview of the Siemens SCC-8000H series product portfolio, which is meanwhile based on a fully proven technology. The main elements of the different solutions for 50Hz and 60Hz were presented. Siemens’ H-Class product portfolio is based on single shaft and multi shaft arrangements with optimized water / steam cycle and live steam parameters up to 600°C and 170 bars. The wide range of different solutions is based on pre-engineered and pre-optimized designs. The product portfolio offers several solutions with a flexible scope of supply and covers all relevant applications for 50Hz and 60Hz, e.g. Cogeneration. In this regard Siemens Energy Solutions provides plant products, which are optimized to achieve a fuel utilization level higher than 85% using up to 3 stages steam extraction. Despite the additional CHP related complexity, the plant portfolio is able to offer solutions in single shaft flour mounted arrangements and achieve an extremely compact footprint.

In order to achieve highest operational efficiency without compromising the plant efficiency and its service life, Siemens Energy Solutions based all development activities on a global integrated approach, where all plant components besides the gas turbine are considered and optimized at the same time. This is possible, since Siemens Energy Solutions has all required engineering competencies and major components inhouse. The global solution design approach enables the achievement of outstanding performance, flexibility and reliability results as it has been impressively demonstrated in Ulrich Hartman plant, our H-class front runner. Finally Siemens Energy Solutions global approach leads to economically viable and sustainable answers, which drastically reduce life cycle cost and hence maximize customer’s value add. The commercial success of the SCC-8000H series provides numerous proof points of Siemens Energy Solutions’ philosophy. The worldwide acceptance of this product line from Asia over Europe to the United States shows our customer’s trust. Latest project awards provide references for all different plant configurations from 1 on 1 up to 3 on 1 arrangement, from a daily cycling plant up to purely baseload plant, from 100% condensation operation up to large steam extraction.
5. References


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