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FOTOVOLTAİK TEKNOLOJİ

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ÖNSÖZ

Günümüz dünyasında küresel ısınma ve iklim değişikliği güncel ve artan endişelerdir. Hızlı ekonomik gelişme ve teknolojik ilerleme, dünya genelinde enerji taleplerini artırmış ve artırmaya devam etmektedir. Geleneksel olarak fosil yakıtlar, sanayi devriminin başlangıcından bu yana enerji üretimi amacıyla kullanılmaktadır. Sanayileşmiş dünyanın itici gücü olarak 2019 yılında dünya enerji üretiminin %81'inden fazlasına katkıda bulunmaktadır. Teknolojik gelişme ve enerji taleplerinin giderek artması, sera gazı (GHG) emisyonlarında önemli artışlarla sonuçlanmıştır. Bu durum yağış, kar ve buz örtüsü modellerinde değişiklikler ve deniz seviyesinin yükselmesi gibi olumsuz etkilere yol açabilmektedir. Fosil yakıtların yanması nedeniyle atmosferdeki karbondioksit (CO_2) konsantrasyonu artmakta, doğal sera etkisini ve küresel ısınmayı artırmaktadır.

Sürekli artan bu GHG emisyonlarını azaltmak, düşük karbon teknolojilerini, yenilenebilir enerji kaynaklarını ve enerji verimliliği stratejilerini kapsayabilir. Çevre korumanın önemi ve ürün ve hizmetlerle ilişkili potansiyel çevresel etkiler konusunda artan farkındalık, araştırma odağında yer almakta ve bu çevresel etkileri daha iyi anlamak ve değerlendirmek veya azaltmak için yöntemler geliştirmeye ilgi çekmektedir.

Dünya genelinde 2022 yılı sonunda güneş enerjisi, 1046,6 GW kurulu kapasiteyle (%31) hidroelektrikten sonra ikinci en büyük yenilenebilir elektrik kaynağı olmuştur. Son yıllarda fotovoltaik (PV) teknoloji olgunlaşmış ve yenilenebilir elektrik üretiminin en hızlı büyüyen yöntemi olarak ortaya çıkmıştır. PV etki, fotoelektrik etkiden yararlanan yarı iletkenler aracılığıyla ışınımın elektriğe dönüştürülmesini kapsar. PV hücre ve modül teknolojilerinin başlıca türleri arasında kristal silikon (mono ve poli), ince film (Bakır İndiyum Galyum Selenit (CIGS), Kadmiyum Tellür (CdTe), amorf silikon (a-Si), perovskit) ve çok eklemli (ışığın çeşitli dalga boylarını soğurmak için farklı yarı iletken malzemelerin çoklu p-n bağlantılarını kullanan) modüller yer alır. PV sistemler zemine veya bina çatılarına yerleştirilebilir. Üretilen elektriğin nasıl yönetildiğine bağlı olarak, PV sistemler şebekeye bağlı veya bağımsız olarak sınıflandırılabilir. Bu sistemler; konut, ticari veya kamu hizmeti ölçeğinde tasarımlanabilir. Bir PV sisteminin temel bileşenleri arasında; PV modüller, destek sistemi, izleme sistemi ve invertör yer alır.

PV sektörü, 2022 yılı baharında en yüksek 1 terawatt (TW) kümülatif kurulu PV kapasite ve 200 ile 230 gigawatt (GWp) arasında değişen yıllık hücre ve modül üretimine ulaşmıştır. Önümüzdeki 5 ile 7 yıl içinde yıllık üretimde 1 TW'lık zirvesine ulaşılması beklenmekte ve önümüzdeki on yılın başında 2 TW'lık bir zirveye çıkması öngörülmektedir. Bu ilerleme, 2016 yılında imzalanan *Paris Anlaşması*'nda belirtildiği gibi, küresel sıcaklık artışını yüzyılın ortasına kadar 1,5 °C ile sınırlama hedefiyle uyumlu olarak dünya genelinde GHG emisyonlarını azaltmayı amaçlamaktadır. *Uluslararası Enerji Ajansı* (IEA), 2050 yılına kadar net sıfır emisyona ulaşmak için, 2050 yılında küresel elektrik üretiminin yaklaşık %90'ının yenilenebilir kaynaklardan üretilmesi gerektiğini bildirmiştir. 2030 ile 2050 yılları arasında küresel elektrik üretiminin güneş PV ve rüzgârın birlikte yaklaşık olarak %70'ini oluşturması beklenmekte ve yıllık 630 GWp kapasite ilavesi yapılması gerekmektedir.

Otuzbir bölümden oluşan bu kitapta; fotovoltaik teknoloji ile güneşten elektrik üretiminin tasarım, planlama, kurulum, işletme ve kullanımına ilişkin bilgiler derlenmiştir ve temel özellikler incelenmiştir. Çalışmanın konu ile ilgilenenlere yardımcı olmasını dilerim.

Prof.Dr. Hasan Hüseyin ÖZTÜRK

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