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In [11]: from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
from sklearn.metrics import davies_bouldin_score

# Normalize customer features
scaled_data = scaler.fit_transform(customer_profiles[['TotalValue', 'Quantity

# Apply K-Means
kmeans = KMeans(n_clusters=4, random_state=42)
clusters = kmeans.fit_predict(scaled_data)
customer_profiles['Cluster'] = clusters

# Evaluate clustering
db_index = davies_bouldin_score(scaled_data, clusters)
print("Davies-Bouldin Index:", db_index)

# Visualize clusters using PCA
pca = PCA(n_components=2)
pca_data = pca.fit_transform(scaled_data)
plt.figure(figsize=(8, 5))
sns.scatterplot(x=pca_data[:, 0], y=pca_data[:, 1], hue=customer_profiles['Cluster'])
plt.title("Customer Segments")
plt.xlabel("PCA Component 1")
plt.ylabel("PCA Component 2")
plt.show()

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Davies-Bouldin Index: 0.7101844728381475

